ptember 1949

SEP 29

Chemical Industries

Including CHEMICAL SPECIALTIES

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Cover: Dewatering pentaerythritol

Convenient sales offices—ample local stocks the nation over

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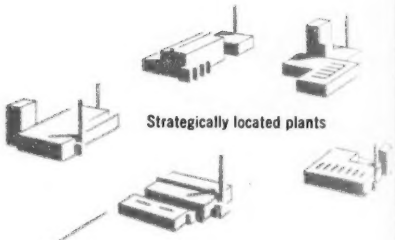

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It pays to specify SOLVAY

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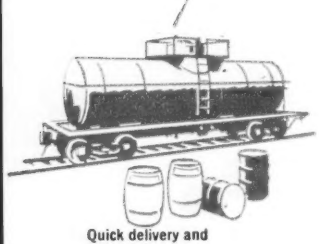
With today's costs of manufacturing so high, it's the wise chemical buyer who considers his purchases from every angle. Price and specification alone are no longer basis enough for a buying decision.

There is a good deal more a buyer can expect—speed of delivery, technical service, big-plant capacity to assure continued supply, knowledge of the industry and experience with its problems. On all these counts, more and more manufacturers agree, "it pays to specify Solvay."



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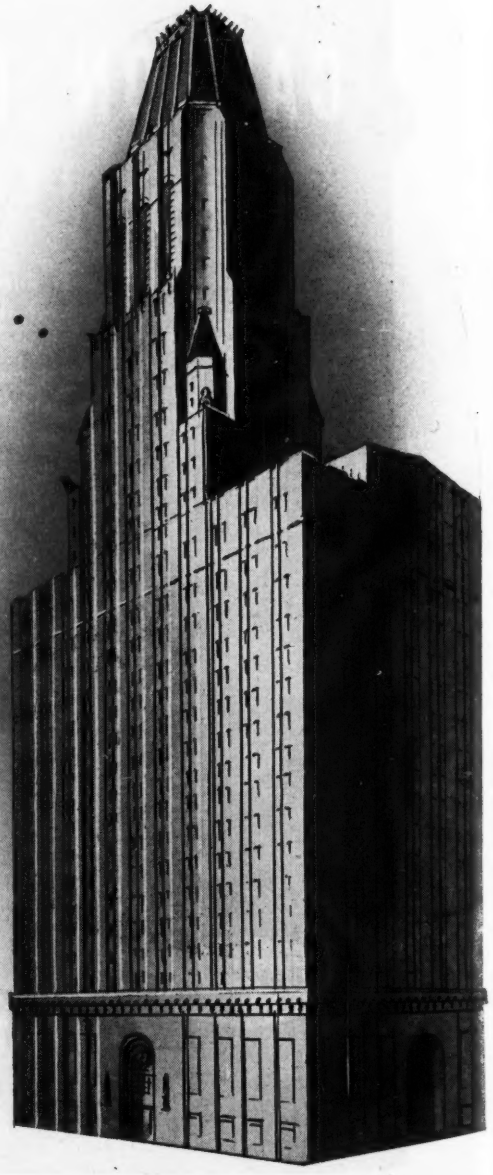

● This fall, Mathieson Chemical Corporation moves to its new executive offices in the 34-story Mathieson Building, Baltimore, Maryland.

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Chemical Industries

Including CHEMICAL SPECIALTIES

Vol. 65, No. 3

SEPTEMBER 1949

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

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Chemical Industries is indexed regularly by Engineering Index, Inc., and Industrial Arts Index.

Cover: Hercules Powder Company

ABP ABC

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Published monthly at 1309 Noble St., Philadelphia 23, Pa., and entered as 2nd class matter July 15, 1944, at the Post Office at Philadelphia 4, Pa., under the Act of March 3, 1879. Subscription $5 a year, $8 for two years, $10 for 3 years. Add $2 per year for postage to Latin America. Other foreign rates, except Canada, $15 one year, $30 for 3 years. Single copies 60c, except special issues. Canadian subscriptions and remittances may be sent in Canadian funds to Chemical Industries, P. O. Box 100 Terminal A, Toronto, Canada.

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OFFICE OF PUBLICATION: 1309 Noble Street, Philadelphia 23, Pa. EDITORIAL & EXECUTIVE OFFICES: 522 Fifth Ave., New York 18, MUrray Hill 2-7888. DISTRICT OFFICES: Chicago: 309 West Jackson Boulevard, Chicago 6, Ill., HArrison 7-7890. Los Angeles: 1709 W. 8th St., Los Angeles 14, Calif., FAirfax 8576. San Francisco: 57 Post St., San Francisco 4, Calif., YUkon 6-1069. London: Sun Life of Canada Bldg., Trafalgar Square, London, S. W. 1, England.

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THE READER WRITES

Responsibilities of Shippers

To the Editor of Chemical Industries:

Your editorial in the June issue under the caption "The Responsibilities of Shippers" struck a particularly vibrant and resonant chord with our organization. I want to take this opportunity of expressing our keen appreciation of a very timely statement in your column.

MATHEW M. BRAIDECH
Director of Research, The National Board of Fire Underwriters
New York, N. Y.

Watch Those German Reports

To the Editor of Chemical Industries:

It occurs to me that the attached (see below) letter to the editor of your British contemporary, *Chemistry and Industry*, might also be of some interest to people in America.

HERBERT CHARLES
London, England

"Sir,—We have been engaged for some time in surveying and indexing a number of B.I.O.S., C.I.O.S. and F.I.A.T. publications with particular reference to the manufacture of fine chemicals and have slowly become aware of the fact that a number of the preparations described cannot be accepted at their face value.

Suspicions were aroused when certain processes well known to the writer were found to omit a number of facts of significant importance or when what were known to be obsolete processes were described instead of processes of more modern vintage. As an example of the latter, the process for Diodone given on pp. 172-193 of B.I.O.S. final report 1404 is the older one based on the preparation of 4-pyridone from the very difficultly obtainable pyridyl-pyridinium chloride; it is known that the German works in fact used the far better method starting from chelidonic acid which is referred to by the writer elsewhere. (Industrial Chemist, May, 1947.)

A further example is to be found on p. 9 of B.I.O.S. final report 766 which describes the methylation of diaminoacridine with dimethyl sulphate; it is strongly suspected from private sources of information that the German chemists in fact methylated the diacetylamino acridine, which is most definitely a preferable method.

Latterly we have attempted to repeat some of the procedures described and have found that this cannot be done; unfortunately the work is at the moment of a confidential nature and cannot be disclosed yet.

It is possible that the explanation of these cases is the reluctance of the I.G. executives to pass on trade secrets; it seems clear, however, that whilst the publication may in many cases be a rough guide to aid manufacturers they might in some cases have the exactly opposite effect and that in all cases they must be accepted with some reserve and checked."

M. A. PHILLIPS
Romford, Essex

Good Patents Pay Off

To the Editor of Chemical Industries:

I have read with interest Mr. Albert S. Davis, Jr.'s article in your July issue on how the research department can help in patent matters, and I agree with practically everything Mr. Davis says.

I would like to point out, however, in addition, that well prepared patents are seldom held invalid and seldom held not infringed when the invention has been properly protected.

A statistical examination of patent litigation indicates that about one and one-quarter per cent of the issued patents eventually get into litigation carried through to the bitter end, and most of the litigation is over poorly prepared patents.

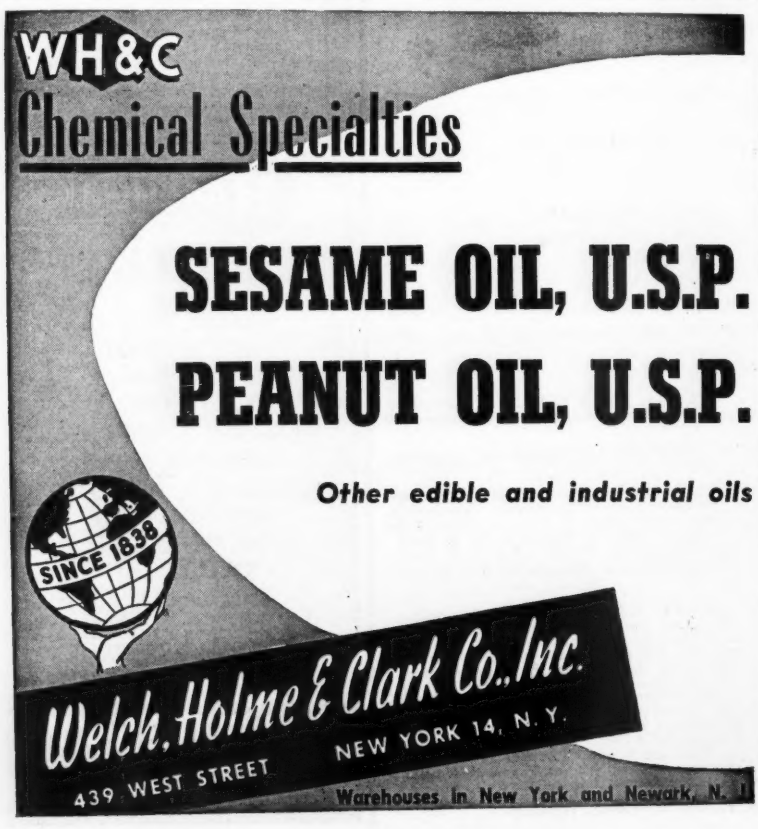
The returns from patentable inventions are often unbelievably great. The Burton patent on distilling gasoline under pressure was appraised for income tax purposes at $70,000,000.00 and was never litigated. Patents on a process and machine for snipping off the ends of string beans were eventually held invalid because a prior user had operated the invention publicly in a small way, but those patents on the string bean snipping produced $3,400,000.00.

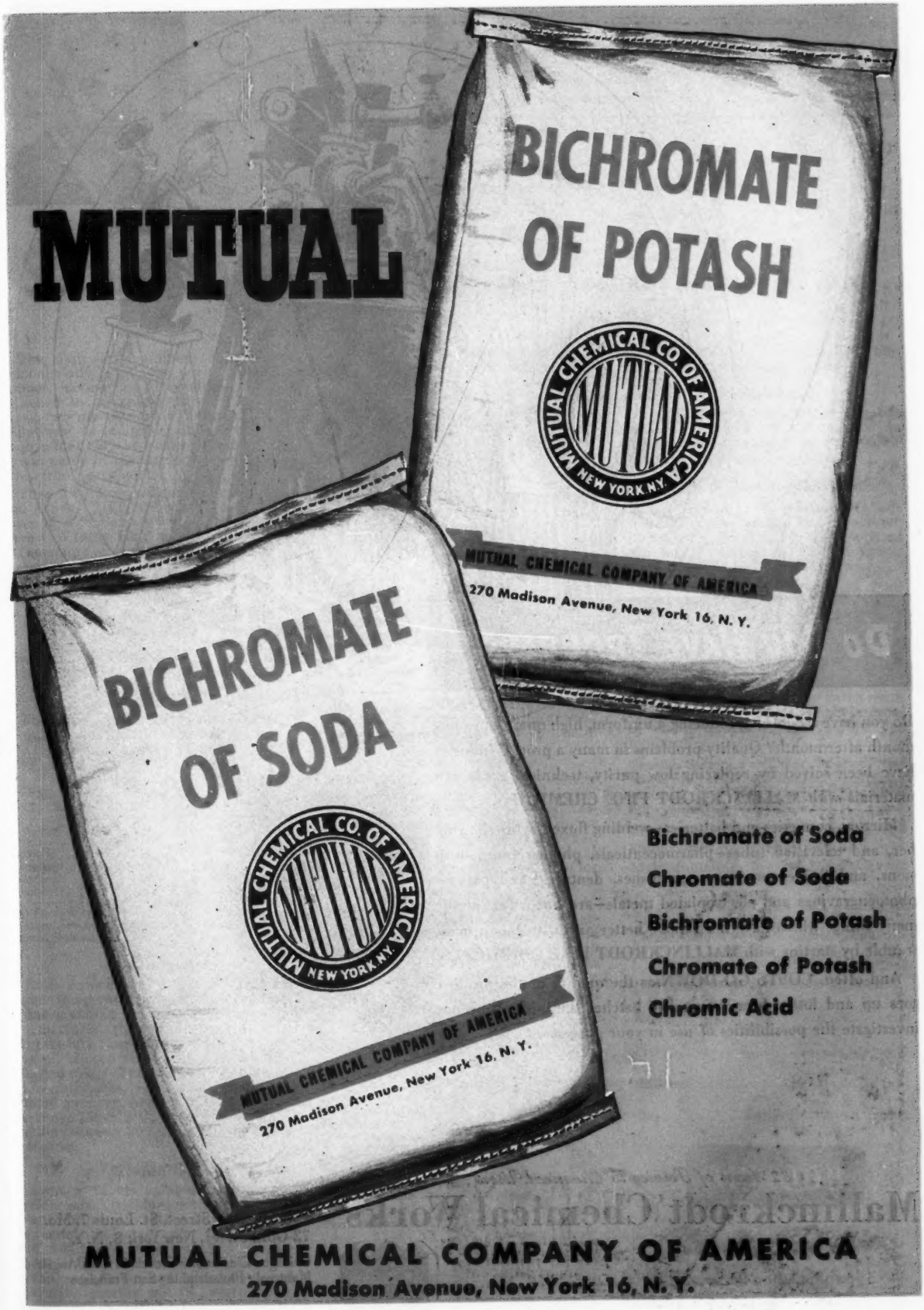
The lesson is that we need more patents better prepared, and we need better appreciation of the fact that patentability in chemical work often turns on the showing of unexpected results or of unexpected products or of products having unpredicable effects.

EDWARD THOMAS, Patent Attorney
New York, N. Y.

Magma, Not Anaconda

In the article "Fissile Fizzle" on page 919 of our June issue the statement is made by our reporter that "Anaconda Copper Mining Co. is raising capital to exploit an 0.8 per cent ore by underground mining methods." We regret this statement is in error. The company concerned is Magma Copper Co., not Anaconda. —ED.

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by Dr. M. R. McCorkle, Use Research and Development Laboratory, Armour and Company

Secondary Fatty Amines AND THEIR QUATERNARY SALTS

The first fatty amines to become commercially available were primary amines, having one fatty alkyl radical attached to an amino nitrogen atom. Now, two new secondary fatty amines of interest to industrial chemists have been added to the series of Armeens (trade name of the Armour amines derived from fatty acids).

These two new Armeens, Armeen 2C and Armeen 2HT, are commercial mixtures of secondary fatty amines. They have two fatty alkyl radicals attached to the amino nitrogen atom. The general formula for these secondary amines may be written as:

$$R_2NH \quad \text{or} \quad \begin{matrix} R \\ \diagdown \\ \quad N\text{-}H \\ \diagup \\ R \end{matrix}$$

where R represents a high molecular weight normal-alkyl (fatty) radical.

Composition

The distribution of long chain N-alkyl radicals, and the average composition and constants of Armeen 2C and Armeen 2HT are:

N-Alkyl Radicals	Carbon Chain Length	Armeen 2C	Armeen 2HT
Octyl	8	8%	...
Decyl	10	9	...
Dodecyl	12	47	...
Tetradecyl	14	18	...
Hexadecyl	16	8	30%
Octadecyl	18	10	70
Approx. mol. comb. wt.		435	520
Apparent secondary amine		80	90
Approx. melting point, °C		46°	68°

Volatility

Both Armeen 2C and 2HT boil at higher temperatures than corresponding primary amines. Because these products are mixtures, they distill over a wide temperature range and especially in the case of Armeen 2C, overlap on the distillation range of corresponding primary amine mixtures. At a pressure of 0.5 mm. of mercury, Armeen 2C distills over the range 160-275°C; while Armeen 2HT distills between 200-275°C at the same pressures.

Solubilities

Armeen 2C is soluble in benzene, cyclohexane, trichloromethane, carbon tetrachloride, ethyl ether, butyl acetate, methanol, 95% ethanol, isopropanol, and n-butanol. It is sparingly soluble (soluble hot) in ethyl acetate and 2-butanone; soluble hot in acetone; and sparingly soluble hot in acetonitrile. Armeen 2C is insoluble in water.

Armeen 2HT is sparingly soluble (soluble hot) in trichloromethane and carbon tetrachloride; soluble hot in benzene, cyclohexane, ethyl acetate, butyl acetate, isopropanol, n-butanol, and 2-butanone. It is sparingly soluble hot in ethyl ether, acetone, and 95% ethanol. Armeen 2HT is insoluble in methanol, acetonitrile, and water.

Reactions

The reactions of Armeens 2C and 2HT are similar to those of the primary amines. They are organic alkalis and react readily with organic or inorganic acid groups.

Oil-soluble quaternary ammonium salts may be produced from the secondary Armeens. (Available commercially as Arquad 2C and Arquad 2HT.) It is often possible to make oil-soluble salts of inorganic acids using the secondary amines as the alkali.

Suggested Uses

In lubricant additives, rust inhibitors, rubber chemicals, textile treating agents, oil-soluble quaternaries and synthetic waxes.

SECONDARY ARQUADS

The availability of the secondary fatty amines has also made possible the production of the secondary quaternary ammonium salts, which Armour has trade-named Arquad 2C and Arquad 2HT. (A series of primary amine Arquads—water soluble—has been available for some time.)

Compatibilities

The oil-soluble Arquads are compatible with both cationic and non-ionic materials. They are not compatible with anionic materials such as soaps or the common anionic synthetic detergents. Their average composition is listed on the chart below:

N-Alkyl Radicals	Carbon Chain Length	Arquad 2C	Arquad 2HT
Octyl	8	8%	..
Decyl	10	9	..
Dodecyl	12	47	..
Tetradecyl	14	18	..
Hexadecyl	16	8	30%
Octadecyl	18	10	70
Total active quaternary		75%	75%
Salt (NaCl)		less than 1%	less than 1%
Isopropyl alcohol		about 24%	about 24%
Form at room temp.		liquid (clouds at 20°C —gels at -25°C)	soft paste (liquid at 60°C)

The oil-soluble Arquads are stable at both high and low pH's and in the presence of most water-soluble salts. They are not precipitated by hard water.

Solubilities

These oil-soluble secondary Arquads are dispersible in water, soluble in naphtha, most hydrocarbons and a variety of other organic solvents.

Commercial Applications

Surface Activity: Oil-soluble Arquads lower the surface tension of water. (From 72 dynes at 25°C, 0.1% dispersion of Arquad 2C reduces tension to 30 dynes, 0.1% of Arquad 2HT to 37 dynes.)

Emulsifying Agents: Because of their dispersibility in water and their solubility in oils, the oil-soluble Arquads are capable of emulsifying oils into water. Such emulsions are "substantive" to cloth, wood, pigments, etc.

Dye Substantivity: Small percentages of Arquad 2C added to the dye baths result in substantivity of dyes for many types of textile materials—even hard-to-dye nylons.

Textile Softeners: These Arquads are powerful cationic softening agents for textiles. They are excellent for their non-yellowing properties.

Germicides: Arquad 2C is a powerful germicide in water dispersion.

Mold Inhibitor: Arquad 2C is also an effective mold inhibitor.

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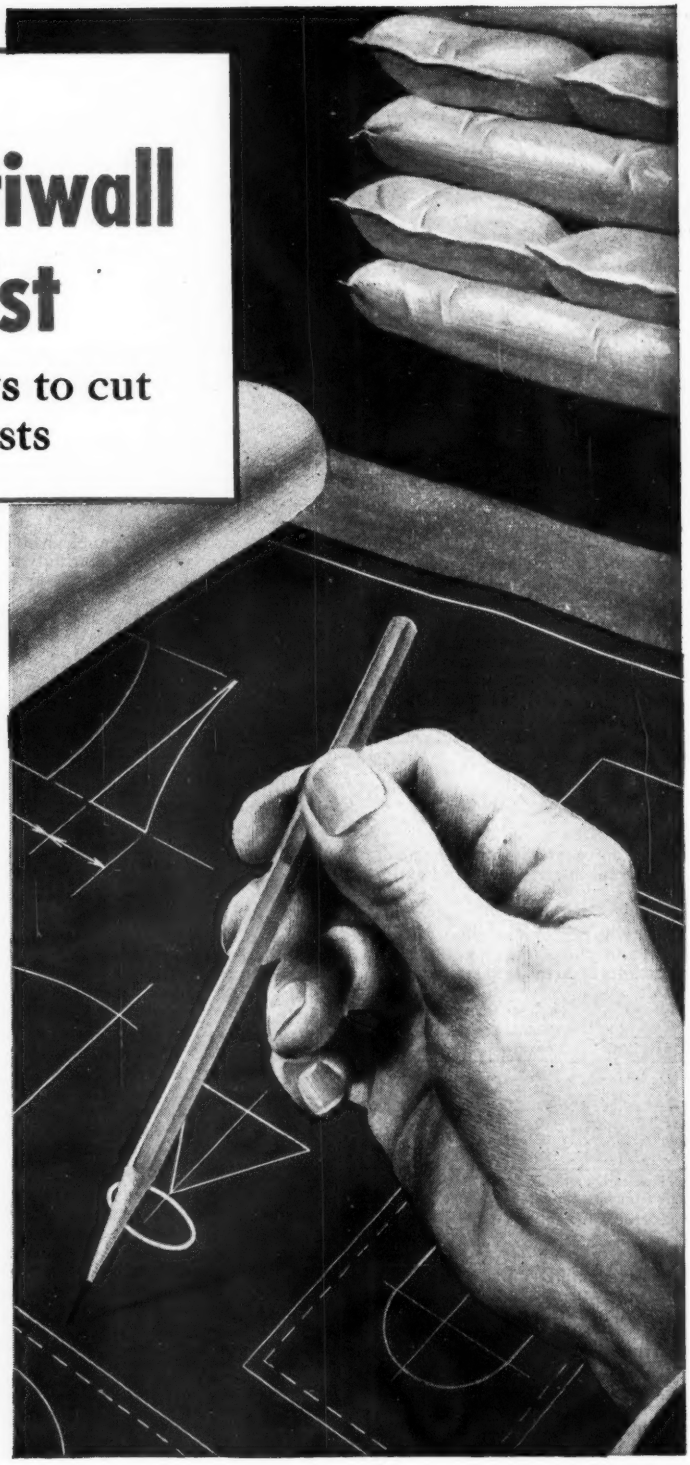

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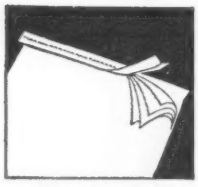

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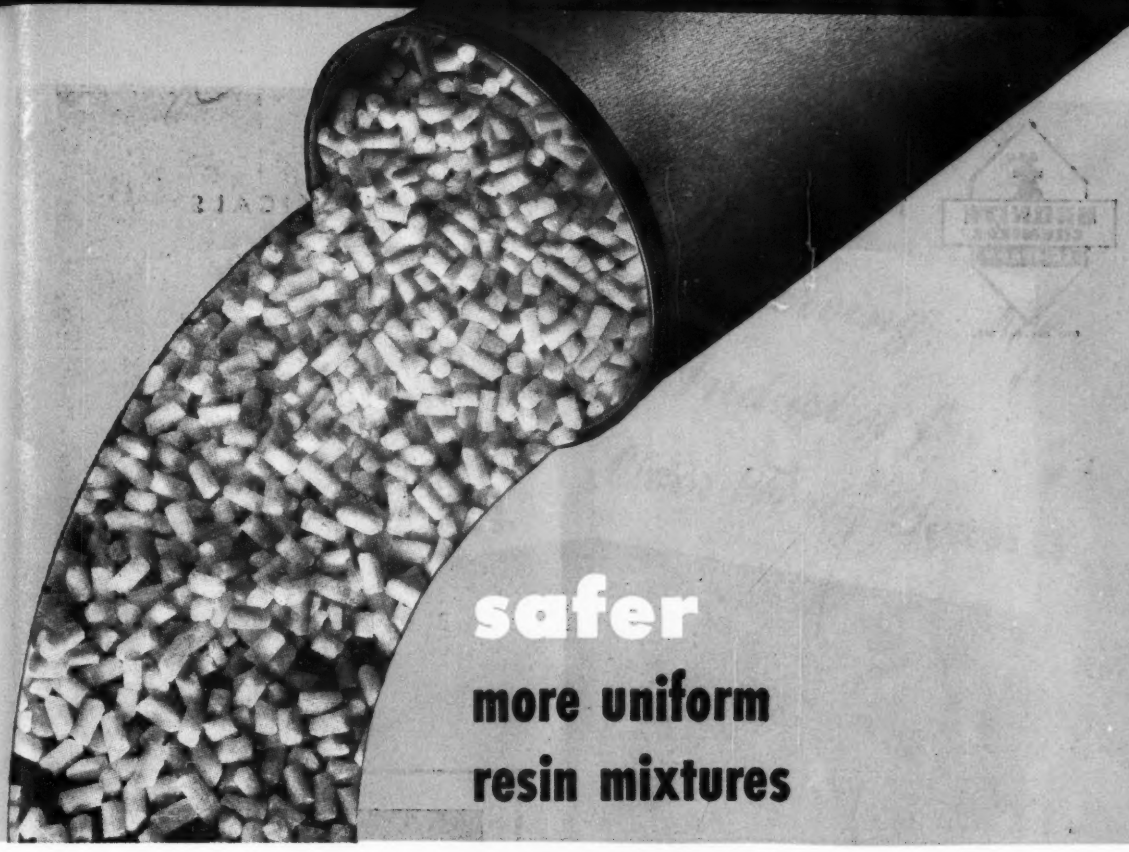

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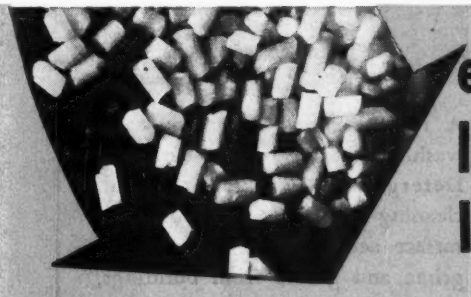

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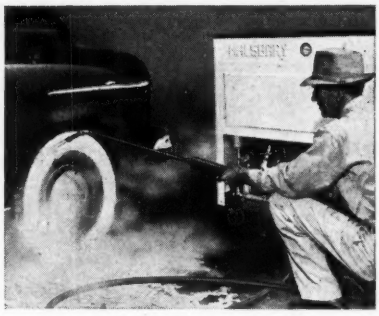

A typical example of improved washing methods is the use of D-40 Detergent in commercial steam cleaning operations. Here, the high surface activity of D-40 helps cut grime and grease from buildings, machinery, metal parts, vehicles, heavy equipment, etc. The quick penetration and soil suspension of this superior product make it ideally suited for all kinds of tough cleaning operations. Remember, for cleaner, faster washing choose D-40 Detergent.

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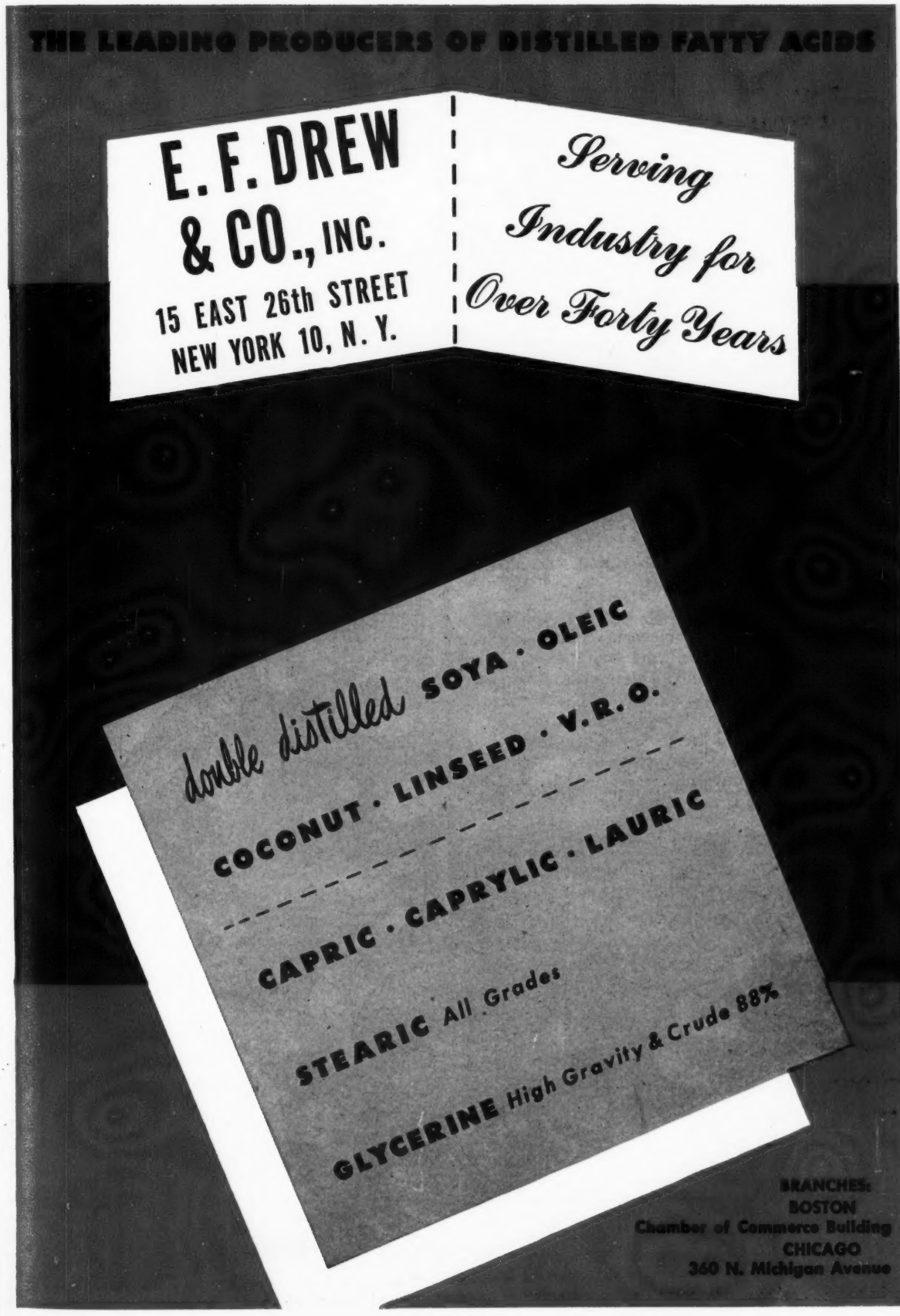
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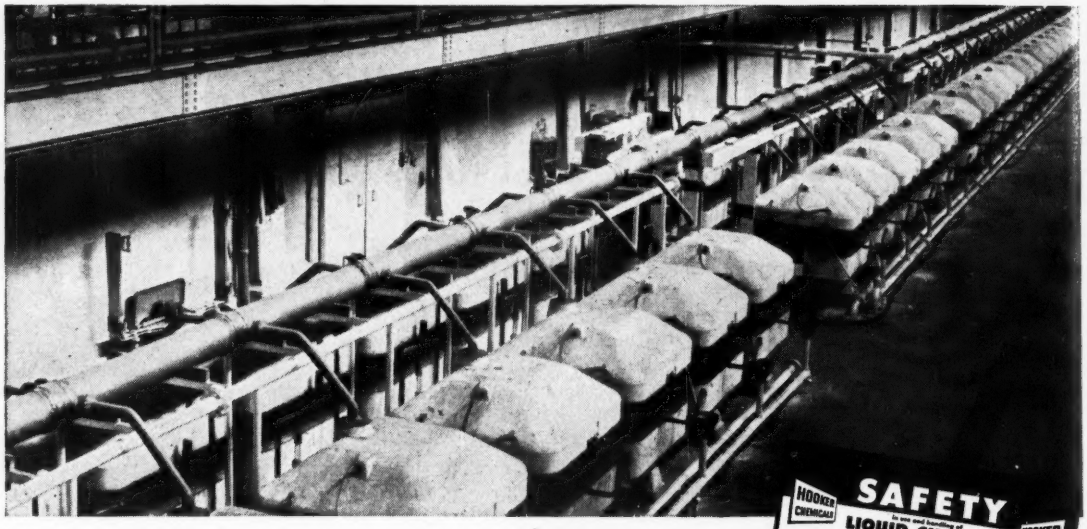

In the Hooker Electrochemical Company you have a dependable source for caustic soda and chlorine of high quality and constant uniformity. This is testified by the increasing number of users who year after year continue to secure their requirements from Hooker.

They have learned through experience that they can rely on these products of the famous Hooker "S" Cell. Produced under watchful control, each shipment is of the same uniform high quality. Through careful inspection and care of containers it reaches you in the same condition it leaves our plants.

Hooker Caustic Soda is available in solid, flake, or liquid form. Liquid is available in 50%, 73% and special grade solutions.

Hooker Liquid Chlorine, of standard market quality, is shipped in cylinders, multi-unit cars and tank cars.

For uniform processing from uniform Liquid Chlorine and Caustic Soda, specify Hooker.

Users of Chlorine will want a copy of the Hooker Wall Chart, "Recommendations for Safety in the Use and Handling of Chlorine in Cylinders and Ton Containers". Printed in large readable type on linen backed paper, it is ideal for mounting wherever you use or store chlorine.

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

HOOKER CHEMICALS

3 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.

NEW YORK, N. Y. • WILMINGTON, CALIF. • TACOMA, WASH.

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SODIUM SULFIDE • SODIUM SULFHYDRATE • SODIUM TETRASULFIDE • CAUSTIC SODA • MURIATIC ACID • PARADICHLOROBENZENE • CHLORINE

if you use phenolics....

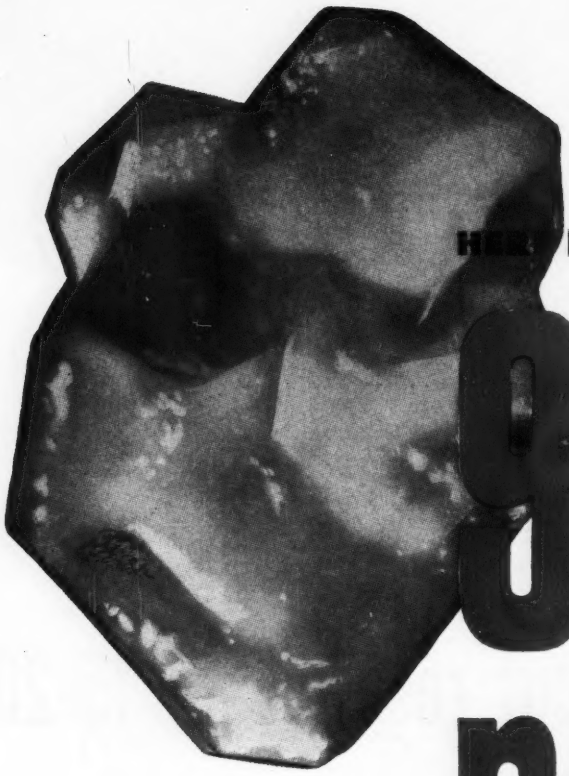
cut resin costs 15-20%

"Vinsol" Resin Emulsions and Solutions

One of the lowest priced, most plentiful dark resins obtainable today, "Vinsol" is saving money for many manufacturers—as a modifier, extender, or partial replacement for phenolics. A 15-20% reduction in total resin costs is common—with no appreciable sacrifice in physical or chemical properties. "Vinsol" is available as a solid resin and in emulsion or solution form for use with water-soluble or spirit-soluble phenolics. We welcome the opportunity to work with you on possible applications. Write for technical details, samples, prices.

HERCULES POWDER COMPANY INCORPORATED 992 Market Street, Wilmington 99, Delaware

"VINSOL" IS REG. U. S. PAT. OFF.



HERE IS A SILICA OF TRUE PURITY

99.71% pure*...

Davison Silica Gel

So pure, for example, that run-of-production Davison Silica Gel is used as an anti-caking agent in pharmaceuticals and foodstuffs without further purification.

This high degree of purity, made possible by controlled Davison processing is also valuable in eliminating the danger of contaminating or poisoning reactions when Davison Silica Gel is used as a catalyst or as a cooperative or inert support for catalytically active compounds.

Davison's close chemical control over production results in a material of such high uniformity that operating conditions remain constant for any given reaction, even when the gel is replenished or completely replaced. Such characteristics as mesh size, pore size, internal surface area, and density are controlled according to specifications during production to give you maximum efficiency in your operation.

Write for information and specifications—
Please mention your proposed application.

***TYPICAL ANALYSIS ON A DRY BASIS**

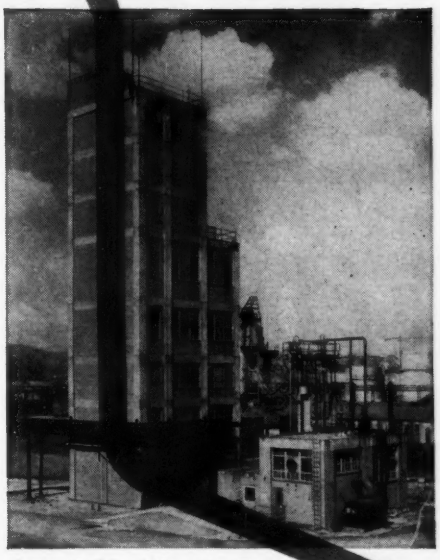
99.71	SiO_2
.03	Fe_2O_3
.10	Al_2O_3
.09	TiO_2
.01	CaO
.02	Na_2O
.01	ZrO_2
.03	Trace Elements

THE DAVISON CHEMICAL CORPORATION

Progress through Chemistry

BALTIMORE-3, MD.

EASTMAN INDUSTRIAL CHEMICALS



Acetone building in Tennessee Eastman's A[illegible]

The chemical industry relies on Eastman Industrial Chemicals for an appreciable percentage of basic organic raw materials. Users are assured of receiving high laboratory quality in commercial quantity, because these materials are produced under vigilantly controlled methods in a modern chemical plant, and are the result of continuous research and development.

In the organic field, Eastman Industrial Chemicals cover aliphatics, aldehydes, acids, anhydrides, esters, and alcohols. In the aromatic series are found anilides, amines, aminophenols, phenols, and phenol ethers. Eastman Industrial Chemicals also include cellulose acetate and cellulose acetate butyrate esters.

Inorganic chemicals among Eastman Industrial Chemicals are technical manganese sulphate, iron oxide, and zinc thiocyanate. Send for our catalog which includes a complete roster of Eastman Industrial Chemicals.

The Tennessee Eastman Corporation plant in Kingsport, Tennessee

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ITS USES ARE Many and Varied

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ICE CREAM
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FLAVOR EMULSIONS
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• Kelco Algin, because of its unique and effective colloidal properties, has won widespread preference in many industries as a superior stabilizing, thickening, suspending, emulsifying, gel-producing, film-forming and adhesive agent.

It will pay you to find out how Kelco Algin can be profitably used to meet your particular requirements. For complete information write to our nearest regional office.

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Prepared Monthly by U. S. Industrial Chemicals, Inc.

U.S.I. CHEMICAL NEWS

September ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1949

U.S.I. Ready to Discuss Customer Requirements Of Synthesis Chemicals

Alcohols, acids, aldehydes, and ketones from the hydrocarbon synthesis process at Brownsville, Texas, will become available, it is now estimated, starting early in 1950. U.S.I. is ready now to discuss the individual requirements of prospective users of these important synthesis products. The chemicals to be offered include:

Alcohols
- Methanol
- Ethanol
- Normal-propanol
- Isopropanol
- Normal-butanol
- Isobutanol
- Normal-pentanol
- Isopentanol

Acids
- Acetic acid
- Propionic acid
- Butyric acid
- Isobutyric acid

Aldehydes
- Acetaldehyde
- Propionaldehyde
- Butyraldehyde

Ketones
- Acetone
- Methyl ethyl ketone
- Methyl propyl ketone
- Methyl butyl ketone

Oil Pierces Hole in Steel In New Punching Method

A practical method for using oil to pierce holes in steel has been developed. Ordinarily, metal punches are used to pierce sheet steel, but the new method is said to replace the punch with a column of oil. Greatest advantage of the "liquid impact" method is reported to be the saving of cost in making and replacing intricately shaped metal punches.

Hard, brittle silicon sheet steel wears out metal punches rapidly. The oil, on the other hand, does not wear out, but is merely recirculated and formed into a new "punch" over and over again. Another advantage claimed for the new method is that it permits use of "soft" steel dies instead of case-hardened steel dies that must be used with metal punches.

Gives German Process Data For Drugs, Intermediates

Translations of technical material on German manufacturing processes for drugs, drug intermediates, and fine chemicals are said to be available now. Included are research reports on new drugs and novel methods of preparation and testing.

New Permanent Antifreeze To Be Marketed by U.S.I.

U.S.I. Ethylene Glycol Permanent Antifreeze Protects against Sub-Zero Temperatures, Prevents Corrosion

This fall, for the first time, U. S. Industrial Chemicals, Inc., will market an ethylene glycol permanent antifreeze. Brought out to meet demand of antifreeze jobbers for a permanent antifreeze as a companion to the time-tested favorite, Super Pyro, U.S.I. Permanent Antifreeze will be available only in limited quantities this first season. Hopes are high, however, for a greater supply for the next antifreeze season.

U.S.I. is by no means a newcomer in the field of permanent antifreeze manufacture. For a number of years U.S.I. has furnished many well-known companies in the industry with ethylene glycol, which these companies have sold under private brand names. Now, U.S.I.'s own permanent antifreeze will be available to take an important place in meeting the needs of distributors and the motoring public.

Boil-proof, Freeze-proof, Rust-proof

The new U.S.I. Permanent Antifreeze is substantially boil-proof; one filling lasts all winter. It affords protection against freezing far down into sub-zero temperature ranges, and a carefully chosen combination of rust inhibitors guards against corrosion in the automobile's cooling system. When used in accordance with instructions, U.S.I. Permanent Antifreeze is guaranteed not to clog passages in the system; not to damage automobile finishes, or metal or rubber parts in the cooling system; and not to leak out of a cooling system that does not leak water.

U.S.I. will, of course, again market Super Pyro Antifreeze this season. Super Pyro was introduced in 1932 as the first premium antifreeze concentrate scientifically compounded to do more than merely protect against freezing. Today's long-lasting, eco-

MORE

Booklet Tells How and Why Of Centrifugal Pump Care

A 16-page booklet on the care of all makes of centrifugal pumps was released recently. Giving information about pump construction and its effect on maintenance, the bulletin reportedly tells how to figure head, and contains tables for determining total friction loss. Causes and cures of various pump troubles are discussed, together with little-known facts about cavitation and how to protect against it. The booklet also relates common mistakes in packing stuffing boxes.

ATTENTION

Users of Specially Denatured Alcohol

Now is the time to renew your basic permit (Treasury Department Form 1479) for 1950. If you require forms or any assistance in their preparation, please call your nearest U.S.I. office.

Old Man Winter will hold no threat for motorists who use the new U.S.I. Permanent Antifreeze. One filling can give protection for the entire winter against freezing temperatures.

CONTINUED

Permanent Antifreeze

nomical Super Pyro is 33 1/3 per cent more effective than most other types of antifreeze. It protects all seven metals in the automobile cooling system against rust, and is free from unpleasant fumes.

Research Assures Continuing Improvement

A special section of U.S.I.'s technical development laboratory at Baltimore devotes

Packaging gallon cans of U.S.I. Permanent Antifreeze at the New Orleans plant. Containers for the new permanent antifreeze come in gallon and quart sizes.

itself to a constant search for improved antifreezes. Tests are continually made of the effects of antifreezes on all kinds of metals, rubber, finishes, and any other substances with which they may come in contact. The research laboratory compiles accurate data on freezing points, boiling points, toxicity, fire hazard, and thermal properties of antifreeze products. U.S.I.'s research also serves to keep the company abreast of any changes in design of automobile cooling systems which might mean the altering of antifreeze properties.

New Spring Has Unique Negative Force-Deflection

An unusual type of spring which resists less the more it is deformed is said to have been invented. Besides its unique negative force-deflection, the new device has four other significant properties: enormous expandability; ability to act around corners and through small openings with freedom comparable to that of non-elastic bands; high initial force in resisting first increments of deflection; and ability to store and deliver about twice as much energy as an ordinary spiral or power spring occupying the same space. Potential uses of the new spring are said to range all the way from delicate instruments to toasters.

Chlorophyll Tooth Paste To Prevent Dental Decay

Research on tooth paste containing chlorophyll indicates that it does away with all the conditions generally regarded to be the causes of dental decay. Chlorophyll has been known for its ability to speed healing of certain gum ailments, including non-specific gingivitis and trench mouth. The new tooth paste, containing water-soluble derivatives of chlorophyll, is said to have greater ability to lower acid content of the mouth than any other known substance. It reportedly has similar power to prevent formation of bacterial acids associated with tooth decay.

Portrays Flavors, Aromas

A new method whereby flavors and aromas can be evaluated objectively and portrayed pictorially was described recently by a pair of researchers.

Diamonds Now Recovered

A new process for economically and profitably recovering industrial diamonds and diamond dust from carbide grinding sludge or dusts is said to have been developed.

TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

An improved rust-inhibitive paint-primer and finish coat combined is reported to give deeper penetration, high gloss, and tougher weathering. **(No. 489)**

For determining evaporation rates of all solvents having a viscosity less than 100 cp., and determining solvent release characteristics of resin solutions, a new device is said to be available. **(No. 490)**

Knives that require no sharpening for three years can now be made, it is reported, by a new "frozen heat" process. **(No. 491)**

To speed up precision filling of ampoules and small bottles by as much as 10 times, a new powder filling machine is claimed to measure accurately chemical, pharmaceutical, or other powders in any quantity from .01 cc. to 7 cc. and then to dispense automatically the desired amounts into containers at strokes from 11 to 22 per minute. **(No. 492)**

To inhibit mildewing of linens, a new chemical, said to require no special equipment or handling, is available. A few cents worth of the material in the final clear rinse when laundering will treat several hundred pounds of linens, it is claimed. **(No. 493)**

A new, inexpensive type of tank heater employing finned tubes gives good heat transfer, it is claimed, and is easy to install and maintain. It is adaptable to almost any requirements, the makers state. **(No. 494)**

For research in synthesis of surface active agents, pharmaceuticals, and other chemicals, a manufacturer offers inexpensive, purified vegetable sterols in tonnage quantities. **(No. 495)**

New long-life fluorescent lamps, said to last from 2½ to 6 years, reportedly deliver over 200 per cent more lighting value than previous lamps, and cut replacement costs by two-thirds. They remain bright and clean, with very little discoloration, up to 5,000 burning hours, the makers claim. **(No. 496)**

Binding of booklets, reports, technical data, photographs, etc., with plastic sheet bindings can be accomplished in less than a minute, it is claimed, with new, economical, portable equipment requiring no special skill to operate. **(No. 497)**

To rotate drums for mixing and agitating, and to move them from place to place, a new portable, motorized drum-cradle truck, suitable for containers from 1-gal. round cans to 55-gal. drums is reported on the market. **(No. 498)**

U.S.I INDUSTRIAL CHEMICALS, INC.

60 EAST 42ND ST., NEW YORK 17, N. Y. U.S.I. BRANCHES IN ALL PRINCIPAL CITIES

ALCOHOLS
Amyl Alcohol
Butanol (Normal Butyl Alcohol)
Fusel Oil—Refined
Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof, C.P. 96%, Absolute
*Solox—proprietary solvent
ANTI-FREEZES
*Super Pyro Anti-freeze
U.S.I. Permanent Anti-freeze
***ANSOLS**
Ansol M
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ACETIC ESTERS
Amyl Acetate
Butyl Acetate
Ethyl Acetate
OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate
PHTHALIC ESTERS
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate
OTHER ESTERS
*Diatol
Diethyl Carbonate
Ethyl Chloroformate

INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-anisidide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate
ETHERS
Ethyl Ether, U.S.P.
Ethyl Ether Absolute—A.C.S.
FEED PRODUCTS
Riboflavin Concentrates *Vacatone 40
*Curbay B-G *Special Liquid Curbay
DL-Methionine
ACETONE
Chemically Pure

RESINS (Synthetic and Natural)
*Aroplax—alkyds and allied materials
*Arofene—pure phenolics
*Arochem—modified types
Ester Gums—all types
Congo Gums—raw, fused & esterified
Natural Resins—all standard grades
INSECTICIDE MATERIALS
CPR Concentrates
Piperonyl Butoxide
Piperonyl Cyclonene
*Pyrenone Concentrates
Pyrethrum Products
Rotenone Products
INSECTIFUGE MATERIALS
*Indalone
Triple-Mix Repellents
OTHER PRODUCTS
Collodions Urethan, U.S.P.
Nitrocellulose Solutions
Ethylene

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Important news for users of STEARIC Acid...

NOW YOU CAN UP *Quality* WITHOUT INCREASING *Costs*

Cosmetics
Creams
Shaving Creams
Soaps
Esters
Palmitates
Pharmaceuticals
Buffing Compounds
Moulded Products
Candles
Crayons
Stearates

Superior performance...prices at pre-war levels

Selling in today's competitive markets requires products with superior performance. When performance is measured in terms of quality *and* dollars—the role of each basic ingredient must be considered. Take STEARIC ACID for example—

With the PRICE of all Emersol Stearic Acids at pre-war levels, and with QUALITY now better than ever, you gain better performance and—even more important—increased satisfaction from your own customers.

CHECK THESE QUALITY ADVANTAGES

IODINE VALUE—Emersol 132 Lily Stearic Acid has the lowest Iodine Value (1.0 max.) among commercial stearic acids. It is recommended where highest purity is essential.

COLOR—COLOR STABILITY—All Emersol Stearic Acids possess superior initial colors, grade for grade—and exhibit a resistance to color change upon heating, uncommon among all stearic acids. This stability confers a like stability upon products made from Emersol Stearics.

ODOR—ODOR STABILITY—An important characteristic *not found in substitutes* and essential in the manufacture of most products in which a solid saturated fatty acid is a major ingredient.

COMPOSITION—Emersol processing provides a range of compositions. Emery's solid acids are available in all standard grades (single, double and triple-pressed types). Titers range from 127-131°F for Emersol 140 Palmitic Acid to 147-149° F for Emersol 150 Stearic Acid*.

BETTER PRODUCTS, LOWER PRICES—We urge you to make comparisons of an Emersol Stearic Acid with any product you now are using. Compare its performance in terms of quality and dollars.

***EMERSOL 150 STEARIC ACID containing a minimum of 80% "true" stearic acid, is the latest addition to Emery's line of solid saturated fatty acids.**

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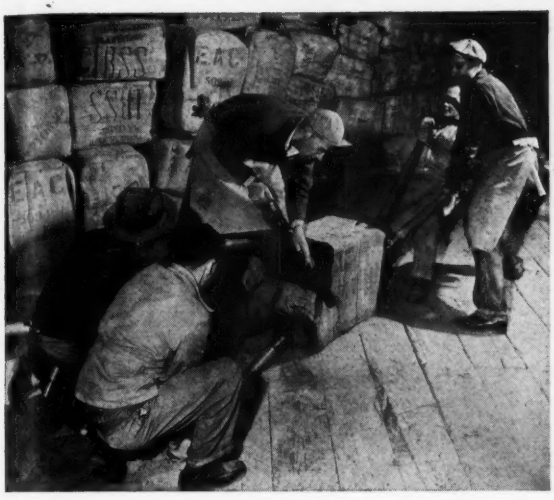
Life ...on the

CALCINATION OF UNITANE® TITANIUM DIOXIDE takes place inside this giant rotary kiln located at the Gloucester plant of Cyanamid's Calco Chemical Division. One of the country's major producers of this important pigment, Calco supplies its high quality Unitane brand in several grades of both the anatase and rutile types to meet industry's most exacting requirements. Use the coupon to send for free folder giving specifications and properties on all grades of Calco UNITANE.

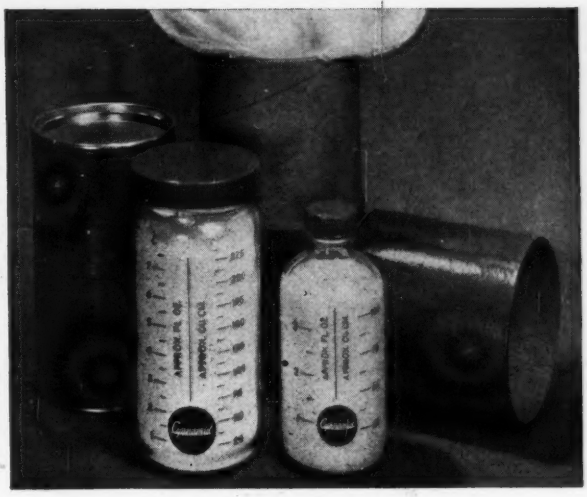
PLASTIC DISHES made of MELMAC® Molding Compound go on sale this month to Mr. and Mrs. Public via department stores all over the country. To be introduced by advertising in national magazines, this new day dinnerware will be offered in many attractive colors. Cyanamid's MELMAC Molding material is also widely used for many industrial and electrical applications. Further information on its properties and applications will be sent promptly on request. Just check the coupon.

As the "FIX-UP, PAINT-UP" BRIGADE goes to work this fall, brighter tints will be increasingly popular for interior decoration. For the paint trade, Ultramarine Blue, manufactured by Cyanamid's Calco Chemical Division, is one of the most brilliant tinting materials available. This blue pigment finds application in the preparation of paints, papers, inks, floor coverings and a wide range of other products. A technical bulletin on the properties and application of Calco Ultramarine is available on request.

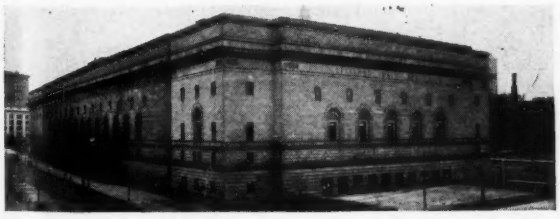
Chemical Newsfront



PEPTON® 22, RUBBER PLASTICIZER reduces breakdown time by more than 50% and has the added advantage that it may be added directly to the latex solution prior to coagulation. This makes it possible to eliminate this operation in the compounding room—another important advantage. Photo above shows treated No. 1 Ribbed Smoked Sheets being examined as shipment arrived at a U. S. port. Further information on PEPTON 22 will be supplied on request. Just check the coupon below.



SAMPLE PACKAGES DRESS UP. Cyanamid's new sample bottles are graduated, in both fluid ounce and cc. scales, permanently fused in the glass, to enable users to approximate at a glance the amount of the contents. They also provide handy laboratory re-use containers. Two styles, narrow mouth for liquids and wide mouth for solids, are available in 4- and 8-oz. sizes equipped with screw caps made of Cyanamid's BEETLE® Plastic. This is another Cyanamid development in chemical packaging for convenience of its customers.



NATIONAL METAL EXPOSITION will be held in the Cleveland Public Auditorium, Cleveland, Ohio, October 21st to 27th. Cyanamid, exhibiting at the show, will have on display its AEROCARB® Carburizing Compounds and other products for the metal treating industries. Featured will be AEROCARB E & W, offering an improved "easy-washing" method that cuts washing time from hours to minutes, plus several other advantages. Advance technical information will be mailed on request.

American Cyanamid Company
Industrial Chemicals Division
30 Rockefeller Plaza, New York 20, N. Y.

Please send the technical literature on the products checked:

- ☐ UNITANE Titanium Dioxides for .....
  (*type of use*)
- ☐ MELMAC Molding Compound
- ☐ Calco ULTRAMARINE
- ☐ PEPTON 22 Plasticizer
- ☐ AEROCARB Carburizing Compounds

Name .....

Company .....

Address .....

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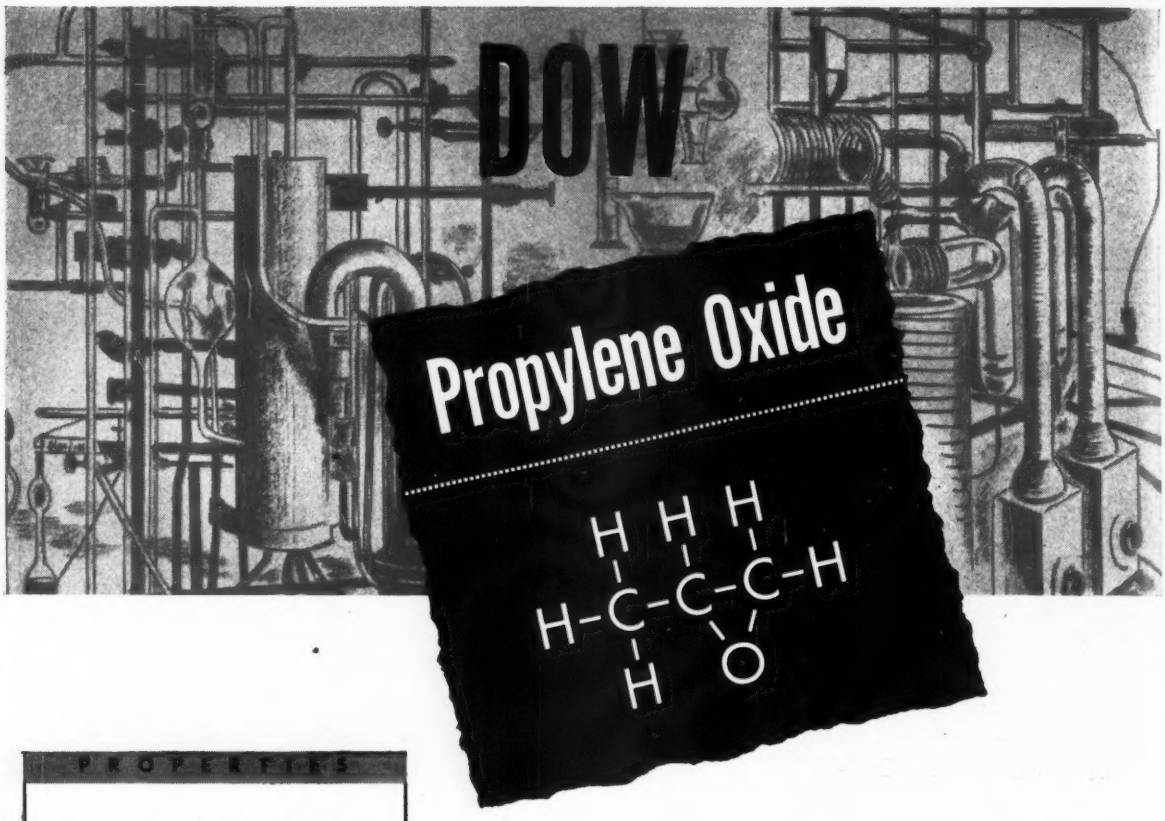

PROPERTIES	
Clear, colorless, volatile, flammable liquid.	
Boiling range, 5-95%	34-35° C.
Specific gravity at 25/25° C.	0.826
Pounds per gallon at 25° C.	6.9
Freezing point	−112° C.
Flash point	below −20° F.
Fire point	below −20° F.
Refractive index at 25° C.	1.363
Viscosity at 25° C., centipoises	0.28
Viscosity at 0° C., centipoises	0.39

Propylene Oxide reacts with amines to form alkanolamines, with alcohols to form glycol ethers, with acids to form esters, and with phenols to form phenoxy alcohols.

In addition to the use of Propylene Oxide as an intermediate, it may be used as a low boiling solvent for cellulose acetate, nitrocellulose, vinyl resins, natural resins, hydrocarbons, and as a sterilizing agent or a product to inhibit the action of yeasts and molds.

Since Propylene Oxide is a liquid at ordinary temperatures, it can be shipped in 55 gallon drums as well as tank cars.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

SEND *for Experimental Sample*

The Dow Chemical Company
Dept. HL
Midland, Michigan
Please send free sample of Propylene Oxide.

Name_____ Title_____

Address_____

City_____ State_____

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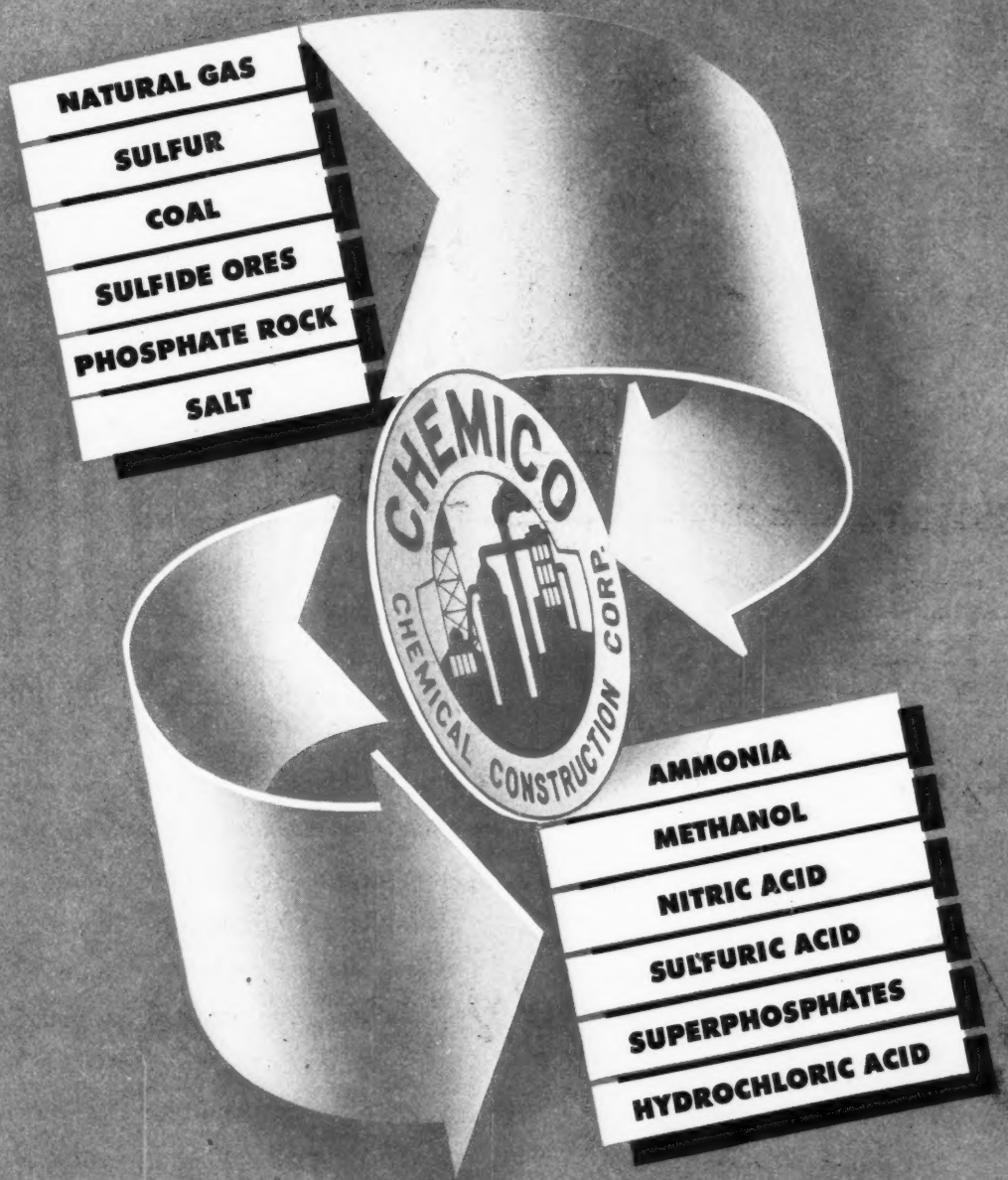
TO PRODUCE HEAVY CHEMICALS AT A PROFIT!



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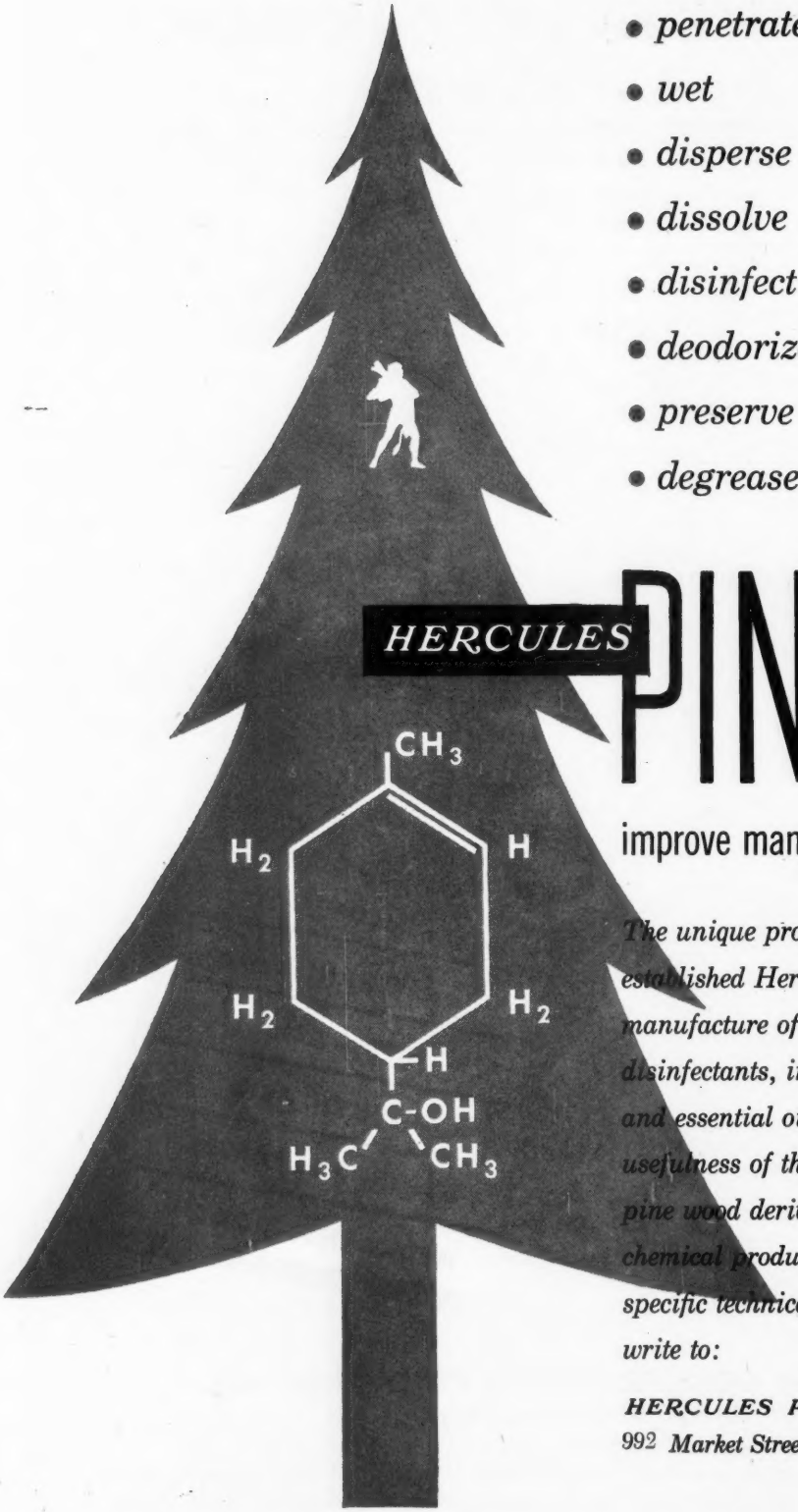

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- *disperse*
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Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

Newsletter,
September, 1949

For Your Information:

A new gasoline additive that may revolutionize compounding and compete significantly with Ethyl fluid is manufactured by Motor Chemical Corp., Chicago, and incorporated by Republic Oil Refining Co. in a motor fuel, "PD" gasoline, now being test-marketed in various Texas cities. Called a combustion catalyst, PD is a metal chelate of pentadione.

By promoting cleaner burning, PD is said to give no-knock performance with "regular" gasoline in high-compression (7½:1) engines, although it doesn't raise the octane rating by standard tests. It also permits a lower fuel:air ratio. It costs the same as Ethyl and is used in the same proportion: 4 cc per gal.

* * CI * *

Those who know maleic anhydride best are frankly puzzled: Capacity has tripled since 1945, and production this year may reach 25 million lbs., grazing CI's two-year-old estimate (December 1947, p. 973). But it is no secret that all of the capacity isn't being used; one producer has been closed down since the first of the year. Another puzzler: Failing to follow the law of supply and demand, the price has inched upward about 2½ cents a lb. since last year.

Despite the apparently saturated market, however, another large chemical company is planning to start making maleic this Fall. Best guess why: Either a new low-cost process or a new undisclosed, large-scale use. At any rate, this looks like a good time to investigate possible maleic uses.

* * CI * *

Pointing up the Gulf Coast oversupply of caustic soda (CI, June 1949, p. 936) are Dow Chemical Co.'s plans to establish a terminal at Carteret, N. J., to distribute its Texas-made (Freeport and Velasco) caustic. Without such ameliorative steps, further expansion of petrochemicals involving chlorine as an intermediate could be seriously retarded in that area.

Dow has also recently started producing magnesium oxide from sea water at Velasco. Both fertilizer-grade and high-grade material are currently being shipped.

Magnesium oxide, incidentally, is one alkali that is not likely to

be overproduced in the foreseeable future. If all sulfite pulp mills switch from calcium- to magnesium-base pulping, as seems probable over the long run, the increased magnesia demand will require much higher production. Weyerhaeuser Timber Co. is using magnesia at its Longview and Everett, Wash., plants (CI, December 1948, p. 938), together with evaporation and recovery units, and anti-pollution groups are applying pressure on other mills to follow suit.

* * CI * *

Du Pont's Grasselli Chemicals Department is making mono-, di- and trimethyl amines in a new plant at La Porte, Texas. Part of the product is used by Grasselli in the manufacture of its Fermate fungicide (ferric dimethyl dithiocarbamate) and the remainder is being sold through Du Pont's Organic Chemicals Department.

A recent U. S. patent (2,467,553) issued to Du Pont may shed some light on Orlon spinning techniques. Described therein is the extrusion of polyacrylonitrile (approximate molecular weight: 121,000) dissolved in dimethyl formamide into a solution of zinc halide at 90-100 deg. C.

Sativa Corp., Putnam, Conn., has been organized to produce textile fiber from domestic flax. This is the first such activity on a commercial scale in the U. S. Encouraged by Government support prices for linseed oil, farmers Midwest—especially in Minnesota—have built flax into a substantial U. S. crop.

* * CI * *

Here and There:

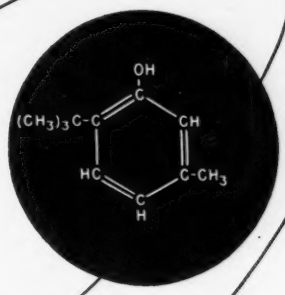
Polyvinyl chloride via a process developed by St. Gobain Co., France, will be made in Elizabethton, Tenn., by American Lucoflex Co. A $200,000 plant will be erected...At least a couple of companies are looking into the possibilities of directly oxidizing ammonia to nitrous oxide...A monthly bulletin highlighting business opportunities arising from federal governmental research is being published by the Office of Technical Services, U. S. Department of Commerce...Heyden Chemical Corp. is offering pilot-plant quantities of three new chemicals: anisoyl chloride, o-chlorocinnamic acid, and 4,4'-dichlorobenzophenone.

Expansion of Columbia Chemicals Division's California natural soda ash plant hinges on a promise, not yet forthcoming, of the local water officials not to flood the dry lake from which the raw materials are derived...Processors of pyrethrum flowers and manufacturers of pyrethrum synergists are producing at top speed as a result of the Department of Agriculture's limitation (CI, May 1949, p. 739) on the use of DDT around dairy and beef cattle...Inland Chemical Corp. has just started operations in a new plant near Little Rock, Ark., to process manganese ore from the Batesville (Ark.) area...Manufacturers of automobile polishes are wondering whether spray coating of cars with plastics (principally acrylates) will really catch on. If so, it may mean trouble ahead, for the big selling point is that a car so coated requires no waxing, stays shiny for a year.

The Editors

KOPPERS MBMC

Mono-tert-butyl-meta-cresol



POTENT GERMICIDE

Koppers Mono-tert-butyl-meta-cresol (MBMC), a clear, liquid alkylated phenol, is a powerful germicide. It has phenol coefficients of 30 and 50, as measured against test organisms such as Eberthella typhi and Staphylococcus aureus. These high phenol coefficients make Koppers MBMC valuable in the formulation of disinfectants and antiseptics, in the stabilization of emulsified cutting oils, and in the preservation of proteinaceous materials.

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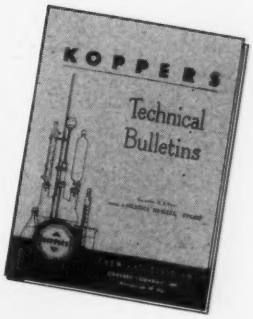
This versatile synthetic organic chemical closely resembles thymol in structure, with the isopropyl group of thymol replaced by the tert-butyl group of MBMC. It will undergo most of the reactions typical of the lower alkylated phenols. As an intermediate, Koppers MBMC is useful in the production of rubber antioxidants and rubber processing chemicals, lubricating oil additives, synthetic resins and for the manufacture of the perfume fixative Musk ambrette.

Write for this bulletin and samples

Physical Properties of the Pure Compound

Freezing Point	**23.5°C.**
Boiling Point, 760 mm	**244°C.**
Specific Gravity, 80°C	**0.922**
Hydroxyl Number (theory)	**342**

Bulletin C-9-130 and experimental samples of Koppers MBMC may be obtained by writing to Koppers Company, Inc., Chemical Division, Dept. CI-99, Pittsburgh 19, Pennsylvania.



KOPPERS

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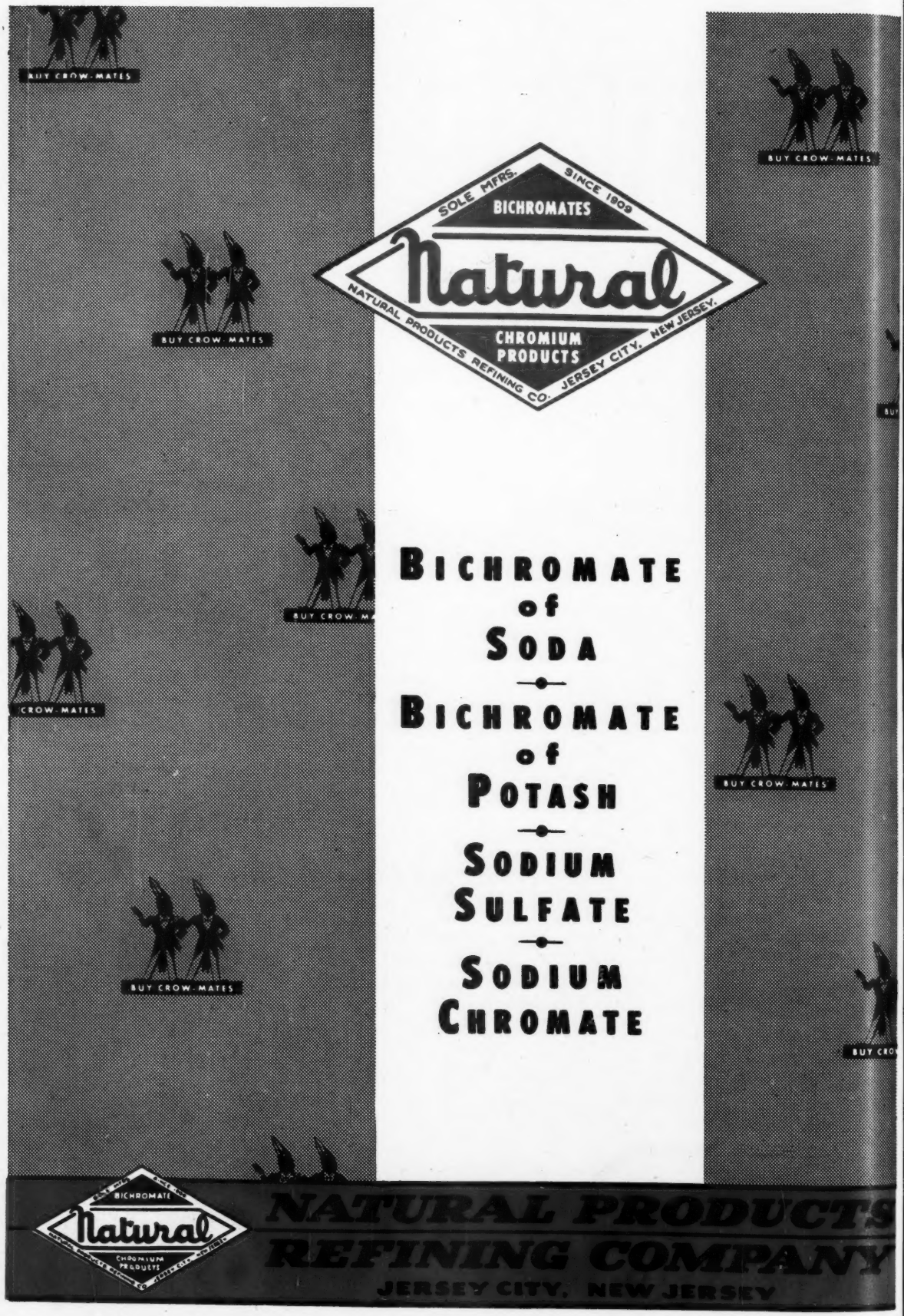
Chemical Division . Pittsburgh 19, Pa.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BETTER TO POLICE THAN BE POLICED

by ROBERT L. TAYLOR, Editor

THE SEVERAL MAJOR CHEMICAL DISASTERS which have occurred since the war raise a question, or perhaps an issue, which it seems to us deserves more thoughtful attention than has thus far been given to it. That question is whether it would not be to the general credit, welfare, and eventual profit of chemical producers and sellers to establish some formal arrangement for self-regulation and self-policing in matters of chemical safety outside the chemical plant, i.e. where the public is concerned.

THE PUBLIC HAS A WAY, which is quite understandable, of extrapolating to sometimes unwarranted degree the dangers which are dramatically and indelibly impressed upon it by such catastrophes as Texas City, the perchloric acid explosion in Los Angeles, and the Holland Tunnel carbon disulfide holocaust. It is bad enough that such losses in lives and property should occur. If they should turn the public against chemicals and result in antipathy and even legislation that interferes with sane and intelligent transportation and use of chemicals, their effect on the industry and the country could be serious indeed.

That there is already a tendency to "crack down" on chemicals in some localities as a result of these recent events is indicated in the article on page 337 of this issue. As pointed out there, some communities have already set up local regulations governing transportation and handling of chemicals which appear to be unnecessarily severe or broad. As is also pointed out there, as long as such restrictions are necessary in the eyes of local officials to protect their citizens, they are going to remain in the statutes. Carried far enough, the situation could result in a hopeless maze of local ordinances and endless confusion and grief for chemical shippers.

RESPONSIBILITY FOR OBSERVANCE of safe handling, packaging and transportation practices is currently left largely up to individual shippers and carriers. Interstate Commerce Commission, whose job it is to draft Federal shipping regulations pertaining to chemicals, has policing powers, but its staff is not adequate to maintain the constant check on shipments that would be required to assure strict compliance with ICC regulations at all times. Nor is it desirable that it should. Compliance with laws that are so clearly and necessarily for the benefit of the industry as well as the public should not require an outside police force. If better policing is necessary, it is certainly to the best interests of the chemical industry that it be done from inside the industry rather than without. ICC representatives have said privately that if some of the shippers and carriers of hazardous materials do not regard ICC regulations more seriously it may be necessary for the Commission to resort to drastic measures with one or two violators as a warning to others.

A CHEMICAL SAFETY POLICE UNIT might be set up either as a separate industry-sponsored agency or as a division of an existing industry organization, such as the Manufacturing Chemists Association. Such a unit, in addition to its policing function, could also perform such useful services as determining safe routings for hazardous shipments and acting as a clearing house for chemical safety information developed by the several organizations which already do original work in this field.

The chemical industry has reached the point in size and importance where it must shoulder perhaps a little more than its share of responsibility for the public safety and welfare where its products are involved. It cannot afford to do otherwise. More and more the philosophy of the courts is moving in the direction of letting the seller beware. The tendency toward local ordinances governing transportation, storage and use of dangerous materials must be headed off by better precautionary measures by the industry and carriers if a hopelessly complicated and needlessly restrictive web of local and state regulations is to be avoided.

To accomplish this calls for an industry agency that is empowered to do more than set standards and print pamphlets. It must have clearly defined regulatory and policing authority. This in turn requires the full support of all units of the industry.

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amine	pounds of 2,4-D acid neutralized by one pound of amine	molecular weight
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Triethylamine	2.2	101
Diethanolamine	2.1	105
Diisopropanolamine	1.7	133
Triethanolamine	1.5	149
Triisopropanolamine	1.2	191

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What's new

THE MAN IN THE CAB

Chemical manufacturers must police selves, educate carriers as trucking problems multiply and public concern over dangerous chemicals grows.

ED TYNDALL heard a "loud boom," saw his truck in flames, jumped out of his cab and ran like hell. His fleet feet probably saved his life.

That was last May when one tube of the Holland Tunnel, under the Hudson River between Jersey City and New York, was put out of commission for 56 hours as the result of a fire started by Tyndall's truckload of carbon disulfide. It caused about a million dollars' damage to property, sixty-five casualties and one death. Driver Tyndall will try to forget his close call, but chemical manufacturers won't dismiss the fire as something unfortunate that happened to the other guy.

This accident is but the most recent of a series of headline chemical mishaps over the past few years which have increased public apprehension of "chemicals" and given rise to more stringent regulation by governmental bodies. It spotlights increased trucking of chemicals, hazards of hauling dangerous materials in densely populated areas, disastrous results of violating transportation regulations. It portends stricter codes governing all phases of chemical activity, tougher penalties for shipping violations. It is making each chemical shipper examine the beam in his own eye, become his motor carrier's keeper.

Trucker's Role Grows

Since the war, railroads in certain areas are estimated to have lost half their less-than-carlot chemical shipping to trucks, largely because of higher freight rates. In metropolitan areas, moreover, there are many small companies—plastics and specialties outfits, and the like—who keep small inventories, purchase a drum of this and a drum of that as they need it, and ship relatively small lots of finished products. This means that there are more trucks carrying chemicals in our most densely populated areas. If a truck carrying a flammable or otherwise dangerous chemical has an accident or fire, it is not on the secluded private land of a railroad, but on a public highway, near other trucks, and probably near many buildings and people. It can cause heavy damage, injury and death.

A leaking cylinder on a truck carrying chlorine cylinders in Brooklyn, N. Y., on June 1, 1944, showed how the effects of an accident can be compounded under such circumstances. The truck happened to be near a subway when the leak ocurred, and the dense fumes were sucked through ventilation shafts of the station by a passing train. Of 418 persons examined, 208 were hospitalized, a number in fairly serious condition although none died. All of 146 claims and suits filed reportedly were settled out of court or by court awards. Had the leak been on a deserted highway, one cylinder of chlorine might have been the only loss.

The increasing number of vehicular tunnels in the United States (ten subaqueous and twenty subterranean handle over 200 million vehicles a year) provides an even greater hazard in trucking. A dangerous chemical could turn any one of them into a gas chamber or an oven if proper precautions were not taken.

Special Rules

The Port of New York Authority, which operates the Holland Tunnel, has special rules governing the amounts and manner in which dangerous articles can be carried over its route. In the case of the recent fire, the trailer-truck was loaded with eighty 55-gallon drums of carbon disulfide, although tunnel rules set 100 gallons as a maximum, and specify glass or earthenware containers of one gallon maximum capacity, or metal containers or drums of five gallons maximum capacity. Moreover, the truck allegedly lacked the DANGEROUS placards required by the Interstate Commerce Commission.

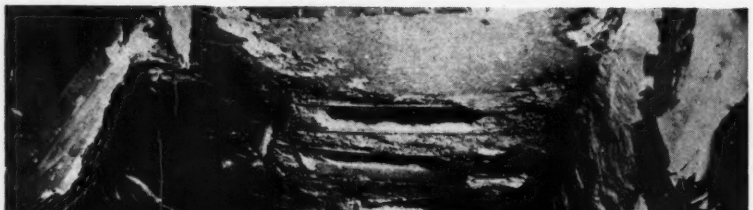
TRUCK DRIVER: More than a wheel.

The U. S. District Attorney in Newark will ask for indictments on the basis of ICC and Port Authority investigations. These reports have not been made public, and the prosecutor will not state who will be indicted, on what or how many counts, or in what way the case may set a precedent. When the grand jury goes into session in the fall, it will be presented with the charges. The Boyce Motor Lines, Jersey City, was the carrier and the J. T. Baker Chemical Co., the shipper. If violations of ICC regulations revealed by the investigations are ruled felonies, the penalty could be as stiff as 10 years imprisonment and/or a fine of $10,000 on each count.

Sharp criticism of the slowness with which this case is being prosecuted and the lightness of the penalty—apart from penalties for violating ICC rules—for violating tunnel regulations ($50 fine and five days in jail) have been voiced in the press. New Jersey is considering a bill to increase the penalty to a $2000 fine and seven years in prison, and similar action is being urged in New York. Municipal authorities will also tighten their controls over chemical shipments, for since the disaster, they have flooded the ICC with calls for information on possible dangerous practices. An example of the directions in which they may go off in protecting their citizens' lives: One little town refused to let carbon disulfide be hauled down the river in a lighter, an excellent and safe method of transportation.

Harder To Operate

Although such illogical prohibitions will probably not stand, other strict regulations will be passed and upheld. Los Angeles' measures to prevent another disaster like the perchloric acid explosion of February 20, 1947, which claimed at least 15 lives, wounded 158 seriously, and did $1.5 million property damage, will soon



HOLLAND TUNNEL FIRE: Spotlight on a problem.

be law. Final public hearings were held early this month on its proposed Dangerous Chemical Code which was drafted with the technical assistance of many organizations (including the MCA, ACS, AIChE*) and which contains some provisions not endorsed by all. Manufacturers are going to find it more difficult to operate under the new rules, but the city is well within its police power in passing laws it feels necessary to protect its citizens from another such catastrophe.

In the field of interstate commerce, the ICC has control. Many shippers do not realize, however, that even where a hazardous article is in intrastate commerce, the ICC can inspect, investigate and recommend prosecution for violation of its rules. Moreover, local authorities can pass regulations affecting intrastate or interstate transportation of dangerous chemicals through their area; these can be more but not less stringent than ICC requirements. Following the Texas City and Brest ammonium nitrate explosions, Parkersburg, W. Va., forbids loading or unloading ammonium nitrate within its limits. This goes much further than any federal regulation, but so long as it is not found to be an unreasonable and unnecessary precaution, no ammonium nitrate will be unloaded there.

The non-uniformity of regulations that are bound to spring up as a result of such separate local laws can make ordinary chemical operations difficult and expensive. These must be expected if the industry pursues a "hands off" attitude until some disaster takes matters out of its hands, and leaves it with more stringent laws to cope with. A recent move in the opposite direction is a new law in the State of Washington placing responsibility for transportation of explosives and other dangerous articles with the State Patrol, and empowering it to make recommendations to the legislature and state departments to bring about uniformity between state and federal regulations. A technical committee consisting of one member each from the explosives, petroleum, chemical and trucking industries and an appointee of the Washington Association of Fire Chiefs will serve in an advisory capacity.

Moral Responsibility

Not all chemical companies realize their responsibility and liability in shipping chemicals. The ICC holds the shipper responsible for knowing the properties of his product (whether it is dangerous, etc.), packaging and labeling it in compliance with ICC Regulations, and furnishing the carrier with a proper bill of lading telling what the chemical is. A shipper's legal responsibility insofar as ICC regulations are concerned, ends with handing the properly packaged and waybilled shipment over to a carrier (if the shipment is not made in company vehicle), but . . .

There also exists a moral responsibility which, at least from a practical viewpoint, the industry must recognize. Railroads, with long experience in handling hazardous chemicals, have staffs well acquainted with established regulations and procedures. When a shipper turns his products over to them, he knows they will get as competent handling as he could give them himself. Not so with most truckers. Excepting carriers of high explosives, they generally don't have the experience nor the staffs to process dangerous chemicals, and personnel turnover is high. The shipper must see that the trucker knows the hazards of the material he is carrying into intimate contact with the public, for if through ignorance or plain negligence, he has an accident with the load, the shipper may find himself a co-defendant in a civil damage suit although he has obeyed the letter of the law. Equally important are repercussions aside from legal aspects which result in public distrust of chemicals and can mean unconsidered laws that are more difficult to have repealed than to avoid.

"Get Tough" Demand

It is generally agreed that there are enough laws on the books to govern transport of chemicals so that public safety is assured. The ICC and such groups as the Manufacturing Chemists' Association, National Fire Protective Association, National Board of Fire Underwriters and the American Trucking Association, Inc., have tried to carry out educational programs to insure compliance with these regulations. In many quarters, including the chemical industry itself, one hears that not only the carriers, but the shippers as well, have taken this emphasis on education as evidence of softness, have not met the issue squarely.

The ICC doesn't have sufficient manpower to properly police the industry (two enforcement officers cover all of New York, New Jersey, and Connecticut, for example) and it has more to worry about than just chemicals. With public clamor for better enforcement, a violator may face the unpleasant role of serving as an example to show the industry that it can't go on taking chances with other people's lives and property.

The National Board of Fire Underwriters, which has just published its excellent report, "The Holland Tunnel Chemical Fire," makes some well-considered suggestions that can form the basis of a positive safety program. In addition to endorsing the recommendations of the Committee on Truck Transportation of the National Fire Protection Association on transportation of dangerous articles by truck, it recommends:

A "safe routing" plan where dangerous chemicals have to traverse tunnels, bridges and congested highways.

Shippers' responsibility for briefing carriers on nature of hazardous cargoes, and supplying required labels and placards to carrier at time of loading.

* Manufacturing Chemists' Association, American Chemical Society, American Institute of Chemical Engineers.

Adoption of standard labels and placards and standard location and manner of fixing on truck.

Data be handed on to any subsequent driver who takes over truck.

Review of legislation governing transportation of such materials to standardize procedures and make penalties for violation more severe where necessary.

Cooperative educational program by ICC, American Trucking Association and all state traffic and fire authorities to supplement legislation and enforcement plans.

Industry Awakening

Many chemical companies, themselves possessing enviable safety records, have taken leading parts in efforts to establish workable regulations. They will undoubtedly accept this latest challenge, both individually and through organizations such as MCA and the National Fire Protective Association.

Other companies have also shown signs of awakening to the problems arising out of chemical trucking. They are checking more frequently with enforcement groups to make sure they are within the law. More important, they are anticipating the trucker's headaches, telling him not only what not to do, but offering suggestions on safe routes and special ferries where there is a particular hazard such as a vehicular tunnel.

These healthy signs could lead to a program that will function continuously and not just for a short time following a major catastrophe. The truck driver holds more than the wheel in his hands when he is hauling chemicals. Chemical companies must make him part of the industry or face public censure, stricter governmental regulation and possible financial loss.

CHEAPER SILICONES

Plaskon's new silane process may mean substantial price reductions, expanded uses for silicones.

THE INDUSTRY knew that Libby-Owens-Ford Glass Co.'s Plaskon Division was about to make known its entry into the still new, but highly competitive, silicones field (*CI Newsletter, March 1949*). But it was not until last month that the cat was really out of the bag: Plaskon has a new process for making alkyl chlorosilanes, intermediates for silicones, which it believes will provide "substantial economies" over competing methods now in use. Just how substantial is something on which Plaskon officials refuse to commit themselves, other than to say that they expect to bring the materials down from a high-priced into "what is generally considered a medium-priced range" for organic intermediates. Reports from the field, however, indicate that the company is shooting for 50¢ a lb. in commercial production.

What Does It Mean?

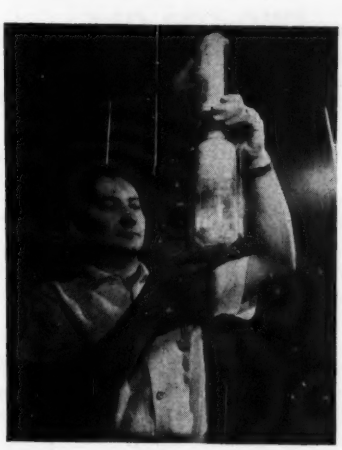
Fifty-cent chlorosilanes could mean several things. They could, and undoubtedly would, mean some drastic reductions in the present $3 to $6-a-lb. prices of silicones. (They yield silicones on simple hydrolysis.) They could mean that silicones would be available for a number of uses from which they have thus far been barred by price. Some possibilities are adhesives and binders, water repellents, heat transfer media, resin modifiers, and broader use in such things as surface coatings and oils and greases. And in addition, they might well open the gates to a wider use of the chlorosilanes themselves as chemical intermediates for entirely new materials. The silanes are highly reactive, and their chemistry is still relatively unexplored.

The process that is expected to make all this possible is being closely guarded by Plaskon. Company officials will reveal no more than to say that it is "continuous and eliminates certain of the rather involved steps now presumably used in conventional processes." The required materials, they claim, are fewer and cheaper, and process cycles are shorter. In the process used by Dow-Corning Corp., the first commercial producer, an aryl or alkyl magnesium chloride Grignard reagent is reacted with silicon tetrachloride to give the corresponding aryl or alkyl silicon chloride (or chlorosilane) and magnesium chloride, while General Electric Co. in its plant at Waterford, N. Y. (*CI August 1948, p. 220*), is believed to be using the Rochow patents, which react elemental silicon—usually in the presence of a catalyst—with aryl or alkyl halides to give the corresponding chlorosilanes.

Doing What Comes Naturally

It is logical that Libby-Owens-Ford should have an interest in silicones. Through its Plaskon Division it has a sizable stake in resins and polymers, and its long experience in glass has naturally attracted it to the broader field of silicon chemistry. It started work on the silanes about five years ago. The present process resulted from this work plus a process developed by an independent laboratory on which Plaskon has the exclusive license.

The company currently has ethyltrichlorosilane, butyltrichlorosilane, cyclohexyltrichlorosilane and trichlorosilane (silico-chloroform) in pilot plant production. It is offering quantities for sale up to drum lots, and samples for experimental use are being provided on a no-charge basis to responsible persons and organizations. It is expected that the products will be available shortly in larger, semi-commercial quantities. The company is planning to use part of the



LOW-TEMP LAB

IN A NEW cryogenics laboratory at Pittsburgh, Pa., Westinghouse Electric Corp. scientists under the direction of Aaron Wexler (*left*) are looking into the super-frigid region a degree or less above absolute zero.

A major interest—and one that ties in with Westinghouse's practical activities—is the resistance-free passage of electricity through metals at extremely low temperatures. This phenomenon, called superconductivity, may be of great significance to future power transmission, says Wexler. Fundamental studies under impractical laboratory conditions may provide the key to practical applications.

Only 13 metals have been found thus far to exhibit the phenomenon. Among these are columbium, tantalum, vanadium and their alloys, for they become perfect conductors at relatively "high" temperatures: columbium at 16° K. and columbium nitride at 29° K. A major research aim is to find metals or alloys that are superconducting at higher and higher temperatures.

The cold-producing process—liquefaction of helium—is fully under automatic electronic and mechanical controls.

expanded output itself, as raw materials for products in fields it is already serving.

A Solid Footing

As far as the future is concerned, Plaskon feels that the outlook for organosilicon materials is good, believes that its new process will give it a solid footing in the competitive struggle. It is already working on some products which will tie in with its aim to develop silicon-bearing compounds closer to certain end uses.

HYDRO-MAGIC

New kind of private label company sells versatile line of concentrates for cosmetics, toiletries, pharmaceuticals and specialties.

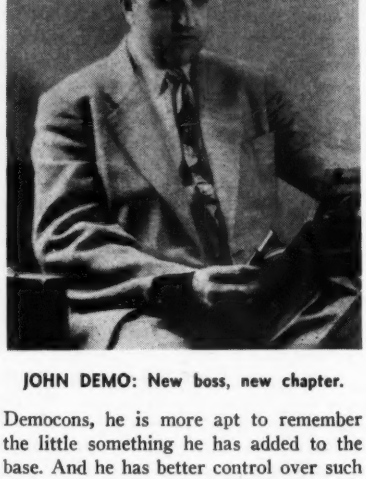
TWO YEARS AGO John Demo did an enviable thing: Stuffing his two M.I.T. engineering diplomas and a picture of his army ordnance buddies into his brief case, he plunked his pipe into his mouth and walked out of his job (vice-president in charge of production for Barbasol Co.). He had gone to work for John Demo.

This action would have meant little to anyone else in the chemical industry (except his successor) had he not begun work on a new type of private label business that may win a chapter in specialties history. As a result of that research, his company, Demo Laboratories, has just moved into full production on the "Democons," a versatile group of chemical mixtures in highly concentrated form. By simply adding water to the Democons, anyone can "manufacture" his own line of cosmetics, toiletries, pharmaceuticals and household and industrial specialties; therein lies their importance to the industry.

No Water To Ship

At first glance, the primary advantage of these concentrates over conventional private brand products is savings on shipping charges for water. This is no small item: 4, 10 or 15 parts of water to one part of Democon is a common proportion in preparing a consumer product. Demo has more to offer than just that, however.

The typical specialties manufacturer is an independent fellow, confident of his ability to manufacture and sell, proud of his line of products. If he uses Democons, he can vary the finishing steps to suit himself, can personalize his product. In addition to following standard directions, he can take advantage of the new company's free consulting service if he wants to modify his product to boost sales in his locale. In his own mind, the specialties man identifies a private label material as the same thing sold to someone else; with



JOHN DEMO: New boss, new chapter.

Democons, he is more apt to remember the little something he has added to the base. And he has better control over such important identifying characteristics as product color and viscosity.

Easy To Make

Because Democons require only simple mixing, they make it easy for a manufacturer to augment his line or for independent jobbers and wholesalers to develop a new line. Moreover, an established manufacturer using Democons can test-market a new type of product and play around with it until he hits on the best selling formula.

Buying from many different sources and carrying inventory on a large number of raw materials is avoided, as are the inevitable left-over items if a product is temporarily out of production or removed from the line. A company can operate with minimum storage space not only because the Democons are highly concentrated, but also because of their versatility. One synthetic detergent blend, for example, will make an all-purpose cleaner, rug and upholstery cleaner, "soap" for fine fabrics, automobile wash, dish washing compound or a window cleaner, depending on how much water is added. Important, too, is the advantage of making fresh stock as needed, thereby eliminating losses from pastes and creams that have dried out and emulsions that have broken.

Natural For Export

Democons hold the same advantages for foreign manufacturers, only more so: shipping distances are longer; and technical knowledge, equipment and raw materials are shorter. In addition, where the made-in-U.S.A. label is potent, a manufacturer can use it; but where nationalistic feeling runs high, he can add water and any desired finishing touches, and say he makes the finished material locally.

Demo is currently negotiating with distributors in Mexico and South America, where it feels the greatest overseas markets lie. Many American manufacturers have representatives there to whom they ship bases to be compounded into their well-known brands. This circumvents prohibitive taxes on certain finished products, and companies operating under such licenses sell items with American trade names receiving heavy advertising support. Demo advances telling arguments why its type of service should be very attractive to such organizations with well-established sales forces: the concentrates won't be taxed as consumer items, cost is little more than the cost of raw materials, and less money leaves the country.

Some Easy, Some Hard

When John Demo hit upon the idea of selling everything but water in a formulation, he was not sure he could formulate a complete line of concentrates easily dispersible in water. Some were relatively simple, but others took a large share of the two years he spent in setting up his business.

With technical problems solved, he thinks that the selling part of the job will be easier, if the response from the manufacturers who have become customers is any indication. Economy and convenience of manufacture are good talking points today, and Demo has plenty to talk about.

TWO FOR ONE

Aldehyde group and double-bond in the same molecule offer interesting possibilities.

FOR years organic chemists have looked longingly at the manifold possibilities of the acrolein molecule: It possesses two highly reactive groups—a double bond and an aldehyde group. This longing is about to be answered for those materials that can stand a cost for intermediates of 50¢ per pound (the new low price recently set by Shell Chemical Corp.). Judging from the low cost of the reactants and the apparent simplicity of the patented process (U.S.P. 2,451,485), it may well go much lower.

Production

Acrolein was first produced by dehydration of glycerine. Shell carried that process using hydrolysis of diallyl ether to the pilot plant stage before adopting the present procedure, direct oxidation of propylene in the presence of a supported cuprous oxide catalyst. Tennessee Eastman Corp. has been interested in the reaction of acetaldehyde and formaldehyde

to acrolein, but at the present time it is not believed that this process is very far along. Celanese Corp. has made several motions in the direction of acrolein production but the company states that any commercialization of its experiments is some time away.

The propylene oxidation process is extremely interesting as it can be applied to a number of olefinic hydrocarbons with production of the corresponding alkyl-substituted acrolein. Yields as high as 86% of the propylene processed are quoted in the patent. Temperature required (200-450° C.) is controlled by adding an inert material such as steam or by supporting the catalyst on a good heat conductor.

POROUS PLASTIC

New fritted fluoroplastic filter disk resists corrosion better than glass or ceramics.

ALL WHO HAVE used porous ceramic or glass filter disks have grumbled and often cursed audibly when the results of many hours work was destroyed by a cracked filter. This problem is greatly magnified in a "hot" laboratory by the need for remote handling and the extremely high unit value of the material being processed.

Now, as a result of an A.E.C. project sponsored by Brookhaven National Laboratory with the Markite Co., comes a fritted plastic filter disk which is both more rugged and has greater resistance to chemicals than previous types of porous disks. Louis G. Stang, Jr., initiator of the project, and Myron A. Coler supervised the project for Brookhaven and Markite respectively.

A survey of materials and fabricating techniques led to the polymer of trifluormonochloroethylene. These polymers, produced at Oak Ridge by Carbide and Carbon Chemicals Corp. under the name Fluorothene and by M. W. Kellogg Co. under the name Kel-F, are resistant to nearly all chemicals, including hydrofluoric, fuming nitric, and hydrochloric acids as well as strong alkalies.

Fabrication

The new plastic filter disks are based on sintering the finely divided plastic to a coherent porous mass. Porosity may be controlled over a wide range and such finely divided precipitates as freshly formed barium sulfate can be retained. Another possible application is the use of these porous plastic disks for aeration with very low pressure drops across the disk. At the moment, interest is centered on fabrication of the disks, but the techniques developed can be extended to a wide variety of shapes.

BUG BARRIER

Department of Agriculture develops insect-repellent treatment for cotton bags; commercial evaluation under way.

MANUFACTURERS, distributors and consumers of flour and other cereal products have long been willing to pay more than the now proverbial $64 for the answer to the question: How can you keep insects out of packages and bags?

U. S. Department of Agriculture investigators Richard T. Cotton and Justus C. Frankenfeld, Bureau of Entomology and Plant Quarantine, Manhattan, Kansas, and Winston B. Strickland, Southern Regional Research Laboratory, New Orleans, have developed an insect-repellent treatment for cotton bags that they feel may be practicable on a commercial scale. The textile bag industry—both individual companies and the Textile Bag Manufacturers Association—is interested in the process and is attempting to substantiate and extend their results on a practical level. It has worked toward the same end for a number of years, and has found that previously proposed treatments have been somewhat less than efficient, effective and economical.

Impregnation Mixture

Formulations of pyrethrins and piperonyl butoxide, two relatively non-toxic compounds, were found to be excellent repellents, and several methods of impregnating bags were tried. A 1:10 pyrethrin:piperonyl butoxide water dispersion was applied to unbleached sheeting during the padding operation (with a wetting agent for penetration) to give finished cloth of varying pyrethrins concentration per square foot. Pyrethrins alone were also used.

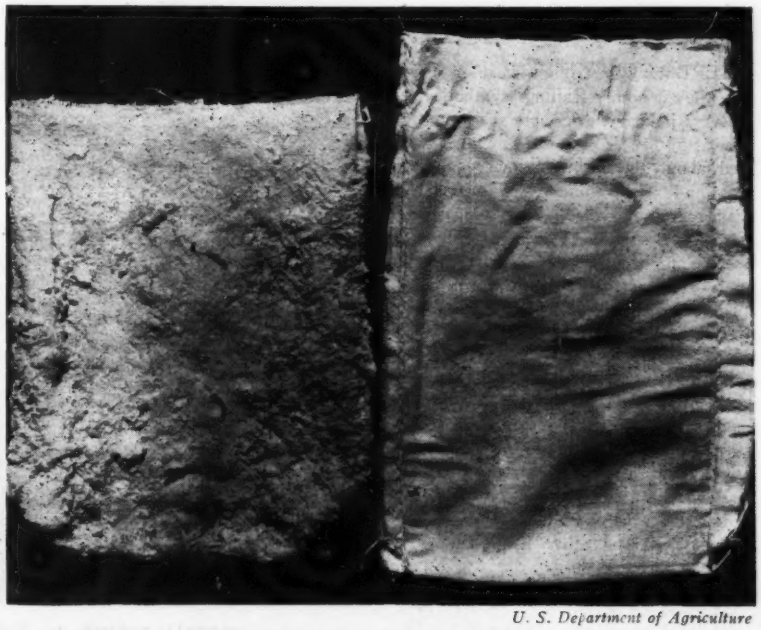
Bags made of this cloth were filled with insect-free flour and exposed for 7 months to continuous infestations by the confused flour beetle, cadelle and Mediterranean flour moth. The effectiveness of the treatment was clearly indicated. (In one test, no insects were found in the pyrethrins-piperonyl butoxide treated bags while 563 insects found their way into an untreated bag.)

The 1:10 mixture of the effective materials was also applied to warp yarn during the sizing operation carried out in the laboratory under conditions similar to mill conditions. Cloth made of this treated warp yarn gave bags with concentrations of 8 and 4 mg. of pyrethrins per square foot. Both concentrations gave excellent protection to bags filled with flour, although untreated bags under the same conditions became infested with insects. Storage of the bags for 5 months prior to use did not affect repellency.

Because light breaks down pyrethrins, the U. S. D. A. workers checked the repellency of bags in darkness, indirect light and indirect sunlight. In all cases the treated bags retained repellency.

More Answers Needed

Although these investigations indicate that flour and other cereal products can be protected by this method for at least 7 months, there are questions of toxicity



U. S. Department of Agriculture

CHEMICAL IMPREGNATION: Treated bag (right) ends open door policy.

and cost to be considered in greater detail before commercialization of the process can be expected. The chemicals employed are among the least toxic to warm-blooded animals, but it is not known whether this treatment would be approved by the Pure Food and Drug Administration. The treated cloth has a slight but unobjectionable odor, and baking tests conducted by the Milling Department of Kansas State College indicate that the quality of flour stored in treated bags is not altered. The U. S. D. A. scientists feel that warp yarns could be treated during sizing operations for the cost of the chemicals alone, which at present prices could make it a practical commercial process.

On the other hand, bag manufacturers will not apply for approval of such a process by the Pure Food and Drug Administration until minimum doses are established and they are sure that the chemicals used will not break off from the cloth to contaminate the product in the bag. They also want to know how long this treatment will remain effective. Moreover, before they start talking about commercial application, they want to see the process carried out on a large scale in a regular cotton mill operation and practical shipping tests conducted to learn how the bags stand up. Undoubtedly, these further tests will be made to determine whether the new treatment can be the key to this long-sought "plus factor" in cotton bags.

ANOTHER OLEO?

Farm bloc eyes falling fats and oils prices, probes synthetic detergents growth.

THERE may be rough weather ahead for the smoothly sailing synthetic detergents industry. A Senate subcommittee headed by Iowa's Guy M. Gillette is worried about the farmers' lower take on fats and oils,* thinks it has found a scapegoat in petroleum-based detergents. Already restrictive legislative measures are being proposed, and more drastic steps are envisioned if future developments warrant.

Trojan Horse

During the war nobody worried much about detergents. They were hailed as saviors of American cleanliness, in fact, at a time when military needs had a priority on fats and oils and when the housewife on her shopping rounds was finding the soap shelf bare.

Today, on the other hand, there's a 400-million-lb. oversupply of tallow and grease; and farm-belt interests, feeling the pinch of lower prices for these products of the range and hog-lot, are anxious to turn back the Trojan horse before it destroys them.

Soapmakers flocked to the hearings last month armed with charts and figures to prove their relative innocence. It was not they, said their spokesmen, but the rubber industry that has stopped using animal fats and oils. Rubber manufacture took 96 million lbs. of soap in 1945, will probably consume about 22 million lbs. this year. It was further shown that total non-soap consumption of tallow had soared from 150 million lbs. in 1938 to 500 million lbs. in 1945, but had eased off to a probable 300 million lbs. this year.

Nevertheless, Lever Bros.' Charles Luckman conceded that synthetics growth had prevented an 11 to 16 per cent expansion of soap usage since 1941; and Oronite Chemical Co.'s George L. Parkhurst estimated that soap would have about half of the synthetics' present market if the latter had not been developed.

Misleading Statistics

The hearings brought out the fact, long known to the chemical industry, that government statistics don't distinguish between fat-based detergents—not properly classifiable as "synthetic" from the farmers' point of view—and the "true" synthetics based on coal or petroleum intermediates.

The result is that committee members, as well as the industry itself, have been hard put to prove just how much they depend on farm products. Sharp requests to the Bureau of the Census are going out, with the result that before any bill is enacted into law, there may be enlightenment on this point.

There is a disposition in Congress to separate the sheep from the goats—the goats, in this case, being the non-farm based detergents.

No Actual Surplus

While granting that synthetics had cut into soap consumption (some estimated that the former constitute a full quarter of the suds-making tonnage), Luckman argued that there is certainly no world-wide surplus of fats and oils. Current production (almost equal to prewar) provides on a per capita basis, because of population increase, some 13 per cent less than the admittedly inadequate prewar consumption. It's a matter of dollar shortages in the fat-short countries. He implied that government-level arrangements to provide a more equitable distribution is the only long-term answer.

Meanwhile, detergent makers contended, fats and oils are being used to an increasing extent in synthetics. Research is being carried out on the utilization of low-grade animal fats, and the Government itself has been granted substantial funds for similar research.

Measures in Making

Contrary arguments notwithstanding, Senator Gillette, clutching his constituents' special interests firmly to his breast, has formulated a bill which would put soaps under the Food and Drug Act—which means that restrictions could be imposed as to content.

Looking into the future—if synthetics should replace as much as 50 per cent of animal fats usually consumed in soapmaking—the butter-margarine folly may be reënacted, with its concomitant prohibitive taxes and punitive restrictions. The familiar argument of protecting small business (i.e., the small, local soapmaker) against the large synthetics suppliers may

*June 30 prices per lb.

	1948	1949
Cottonseed oil	32c	10½c
Soybean oil	24½	9⅛
Tallow	16½	5¾

SOYBEAN FARMER: His Congressman takes up the cudgel.

conceivably be invoked to justify such action.

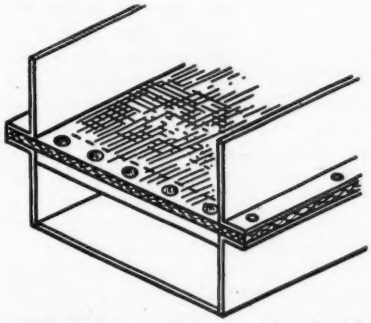
The battle lines are being drawn; and it looks as if arguments, recriminations, and legislative bills will fly back and forth until every farmer in the country finds either oil or coal under his cornfield in the back forty.

AIR-LUBRICATED

Conveyor carries aerated solids 800 to 1200 feet per minute at angles of inclination as low as 4°.

HIGH-PRESSURE AIR has been used for conveying finely divided solids for many years. Now comes the Fuller-Huron Airslide which utilizes low-pressure air to fluidize solids so they will flow like liquids.

The Airslide consists of a rectangular duct or trough divided longitudinally by a stationary horizontal continuous fabric upon which the conveyed solids rest. Air in the lower section of the duct (see illustration) under a pressure of 4 to 12 inches of water passes through the fabric and fluidizes the solids above. In the fluidized state the solids flow readily with angles of inclination as low as 4 to 6.5 degrees.



AIRSLIDE: From a little air, a lot of work.

The new conveyor moves beds ranging in thickness from 1 to 6 inches at velocities from 800 to 1200 feet per minute. Power requirements are low. In one installation, Airslides using eight 2-HP motors driving simple paddle fans replaced screw conveyors powered by 200-HP in connected motor drives. In another installation, two 14-inch Airslides carry 225 tons per hour and use only two 5-HP motors on the fans.

Airfeeder First

The new Airslide grew out of the development of the Fuller-Huron Airfeeder, patented in 1944 by the Huron Portland Cement Co. In the Airfeeder the dry solid is first fluidized with air. In this state the "fluid" flows under one vertical baffle and then over another to reach the outlet. Stoppage of the air supply halts flow and provides a means of controlling the rate at which dry solids are fed.

The fact that there is some horizontal movement of material in the Airfeeder led to the experiments which resulted in the Airslide conveyor. At first, aeration pads were spaced at intervals over the length of the conveyor, but these gave a sporadic action. Further tests disclosed that material could be moved rapidly by gravity if completely aerated. The work ultimately led to the present Airslide design.

The fabric, a heavy canvas, must have sufficient resistance to air flow so that there is no appreciable drop in the static pressure, which must be maintained throughout the whole length of the lower part of the conveyor. The volume of air passing through the fabric is approximately 3 to 5 cubic feet per minute. Should replacement of a section be necessary, standard 10-foot lengths can be bolted into place in 30 minutes.

Around Corners Too

The Airslide can be designed to curve around vertical obstructions. Horizontal obstructions are bypassed by merely step-

SOUND WAVES MIX PAINT

IF EXPERIMENTS now under way at Sherwin-Williams Co.'s Chicago laboratories are successful, equipment similar to that shown above will replace rolling mills and stirring vats in the manufacture of paint.

Taking a page from research involving the use of ultrasonics for homogenizing milk and other liquid mixtures, S-W research men are now attempting to employ high-frequency sound waves—pitched ten times above the range audible to the human ear—to the dispersion of paint pigments in vehicles.

One of the objectives of the work is "package stability," which would end the need for stirring paints before use. In addition, it is hoped that the better dispersion may result in an end to the phenomena of "flooding" and "floating", which cause variations in surface color, and in greater hiding power.

For the experimental work, Sherwin-Williams has built a 2,000-watt sound generator with a speed of 150,000 rpm. The machine, shown above, contains 60 small cone-shaped holes spaced evenly around its stationary head. At maximum speed, it develops 150,000 cycles/sec. Frequency and intensity of the sound waves are controlled by air pressure.

The small box atop the sound generator contains the paint ingredients undergoing test. Ultimately, S-W believes it may be possible to disperse paint ingredients by simply passing them through the field of sound waves.

ping down the conveyor until it can pass underneath. A stream of material may be divided by using a pivoted vane-type splitter at the point of branching. Positioning of the vane controls the proportions going into each branch.

Empties Ships and Trucks

Airslides have been built which cover the bottom of a lake-going vessel to aid in unloading a cargo of cement. To unload the vessel, the Airslides are placed in operation and the cement moves to the screw conveyors in the center which do the actual lifting over the side.

Gramm Trailer Corp., Delphos, Ohio, has been licensed by Huron to manufacture bulk cement carriers using air activation. It is said that a 125-bbl. truckload of cement can be unloaded in six minutes. All other Huron conveyors and feeders are licensed to the Fuller Co., Catasauqua, Pa.

CORTISONE QUEST

Naturally-occurring anti-arthritis factor is limited in quantity; other approaches are being explored.

CORTISONE, alias Compound E, alias 17-hydroxy-11-dehydrocorticosterone, is not new: Dr. Edward C. Kendall, of Mayo Clinc, isolated it from the cortex of the adrenal gland in 1935. But it made news last Spring when its spectacular efficacy in treating rheumatoid arthritis was first announced following a seven-months' preliminary test on fourteen arthritis sufferers.

The cures seemed miraculous: A woman who had barely been able to walk ran up and down stairs; a man whose joints were so painful that he agonized at a touch danced a jig. Improvement is as rapid as it is dramatic. Treatment with the hormone often gives relief after an hour, full recovery in a week.

Other diseases, too, are counteracted by cortisone. Rheumatic fever (a far more lethal enemy of youngsters than polio) and arthritis accompanying certain skin diseases have been treated with encouraging results; and there is hope that the drug may prove useful in such mental conditions as schizophrenia.

Limited Supply

Eventual relief for the millions of arthritis victims depends on a big "if": if a sufficient supply can be made available from natural sources or by synthesis. Like insulin for diabetes or liver extract for anemia, treatment must be continuous. Cessation of cortisone treatment causes a return of arthritic symptoms. An initial dose of 300 mg. and daily doses of 100 mg. are required. (A three-week treatment cost Mayo Clinic $18,000.)

LEWIS H. SARETT: The real McCoy

Kendall first isolated cortisone from the adrenal glands of cattle, but it is contained there in far too small quantities to make extraction practicable. (Incidentally, the difficulty of obtaining cortisone hindered its study until the war, when the Army and Navy heard that adrenal cortex injections enabled German pilots to fly with ease at 40,000 feet. The military services got Kendall, the Office of Scientific Research and Development, Research Corp., various universities and industrial organizations on the job to provide large quantities for investigation.)

Present production means developed by Dr. Lewis H. Sarett, of Merck & Co., in cooperation with Dr. Kendall, uses desoxycholic acid, a component of bile, as raw material for a 37-step synthesis requiring several months.

Plant Source?

Pencil-and-paper chemistry indicates that the synthesis might be shortened to 20 steps by using sarmentogenin, a steroid glycoside obtained from the seeds of an African plant, as starting material; and last month an expedition sponsored by the U. S. Public Health Service and Department of Agriculture set off for Africa to collect seeds and study possibilities of cultivating the plant.

Nevertheless, Dr. Thomas Lewis, vice-president and technical director of S. B. Penick & Co., which has been looking into botanical possibilities for the past five months, is not optimistic about quick results. Which of the fifty *Strophanthus* species is the right one? Can the seeds be stored? Should they be picked before or after ripening? Will cultivated plants (like some *Strophanthus* plants transplanted to Cuba ten years ago) fail to bear seeds? Questions like these, says Lewis, may take years to answer. Penick hopes to capitalize on its experience in growing the seeds and isolating the glycoside starting material, but its hopes are more eventual than immediate.

Another potential vegetable source that has been mentioned is the yam, which contains a steroidal substance whose structure is well along toward that of cortisone. It is conceivable, too, that some common, abundant steroid like cholesterol may eventually be utilized as raw material for cortisone synthesis—although immediate prospects are dim.

Merck, meanwhile, is readying a small batch for 1950 and working on improved synthetic methods. What small stocks are on hand have been allocated not for routine treatment, but for investigation.

Adrenal Stimulation

Cortisone is, of course, contained in the natural secretions of the human adrenal gland; and the adrenal is stimulated to secrete by a pituitary hormone called ACTH (*adrenocorticotropic hormone*). Mayo Clinic has found that ACTH injections, by stimulating the patients' adrenals to secrete their own cortisone, give similar results on arthritis symptoms.

Armour & Co. is currently isolating ACTH, which is probably a polypeptide, from the pituitary glands of slaughtered hogs. (Cattle and sheep pituitaries are ACTH-poor.) Since it takes about 400,000 hog pituitaries to make a pound of ACTH, all of the hogs slaughtered in a year could provide only 1,400,000 doses of 20 mg.—and it is not sure that 20 mg. *per day* per patient is enough. (There are 7 million arthritics in the U. S.) Armour's researchers are exploring every possible avenue of increasing yield and reducing dosage, but they reluctantly admit that synthesis (which may prove, like that of insulin has so far proved, impossible) is the most promising long-term answer to the supply problem.

Before the Dawn?

The discovery of cortisone in the field of biological chemistry has been likened by Oscar Ewing, formerly with Merck and now Federal Security Administrator, to the discovery of atomic energy in the field of physics. "Those who have worked with ACTH," says Armour & Co. in the same vein, "believe that it will be to medicine what the discovery of anesthesia was to surgery." Kendall's colleagues at Mayo hailed cortisone as "the real McCoy" and a great landmark in medicine.

In the brightness of these evaluations, the current situation, in so far as supply is concerned, looks pretty dark. If any parallel can be drawn, however, between this development and the price-and-production histories of insulin, the sex hormones, and antibiotics—and the problems there seemed no less insurmountable at the time—the darkness may yet recede.

MAGNETIC MOLASSES

Hydraulic clutches are only one application of fluids that solidify in a magnetic field.

FREEZING and melting are as old as the Ice Age, but until recently changing temperature was the cause of it all. Not long ago the National Bureau of Standards developed a magnetic counterpart of these phenomena wherein a suspension of iron particles in a suitable liquid is made to freeze and thaw upon the application and removal of a magnetic field; and this principle was put to use in an electromagnetic fluid clutch.

Further research at the Bureau has turned up other potentially important applications of iron-oil mixtures: in hydraulic systems, shock absorbers, and dash pots; to form casting molds; and as variable electrical resistors.

The basic property on which all these applications depend is that the viscosity of a magnetic fluid is directly proportional to the strength of the applied magnetic field—i.e., the fluid may be changed from a liquid to a nearly solid state and back again at will.

In a dash pot—a type of hydraulic shock absorber—a magnetic fluid in the cylinder through which the piston travels would provide an adjustable riding quality for different road conditions.

Employed in any kind of hydraulic system, a magnetic fluid would provide a simple valve wherein the current would control fluid flow past a given point.

Magnetic fluids could be used for meltable molds. The "frozen" mold could be melted after use and the fluid used again.

Since conductivity is proportional to the magnetic field applied, such fluids can be used as variable resistors.

What Iron Powder?

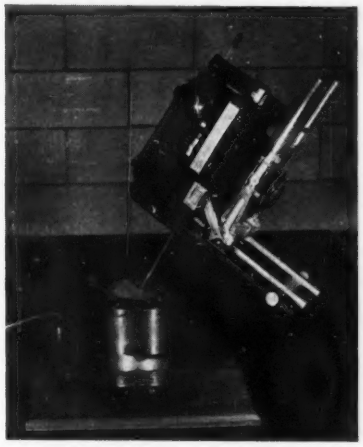
The iron powder is one component of the mixture not generally varied from one application to another, since certain properties are considered essential for satisfactory operation: high permeability; smooth, continuous surface; and chemical stability, resisting oxidation in the suspension fluid. In mixtures where it is essential to prevent settling and sedimentation, the particles should be of uniform size and of 20 microns maximum diameter.

A great many powders have been tried at the National Bureau of Standards including pure iron, alloys, oxides, and ferrites. The powder which has proven most universally successful is a carbonyl iron in the form of particles about 8 microns in diameter. These powders, made by General Aniline & Film Corp. (and in England by Mond Nickel Co., Ltd.) are perfect spheres of high-purity iron—steel, rather, for they contain 0.65-0.80% carbon. The only impurities are nonmetallic. The particles are formed by decomposition in large vessels (so that the iron precipitates in space) of iron pentacarbonyl. This liquid iron derivative, incidentally, is now being sold as a chemical by Antara Products, a division of GA & F.

What suspension fluid?

The choice of a suspension fluid is not so simple. Some of the factors which must be considered are chemical stability, flammability, vapor pressure, and viscosity.

In earlier experiments at the Bureau it was found that many ordinary lubricating oils have enough sulfur in them to cause rapid oxidation and clumping of the iron particles. It was also found that many animal oils (including lard or sperm) tend to catalyze and become gummy and solid. One type of fluid that is remarkably stable in the presence of iron powder is a silicone liquid that has a viscosity of around 50 centistokes at 25° C. It is nonflammable, has a low vapor pressure,



MAGNETIZED FLUID: Freeze without chill.

and will serve satisfactorily in nearly all but extremely high-temperature applications.

When it is necessary to operate a magnetic fluid device at high temperatures, special compounds such as fluorinated and chlorinated fluids can be used. Among the various useful suspension media are polyphenyls, benzene, diphenyl ethers, organic phosphates, and hexachlorobutadiene, a new nonflammable hydraulic fluid.

Surface-active agents are often added to the suspension fluid to prevent hard sedimentation of the iron powder and to aid in redispersion.

Commercialization of magnetic fluid devices could well change the design of hydraulic systems and—more important to the chemical industry—the hydraulic materials that go into them.

PENTAGON DOPE DESK

Defense information bureau tells manufacturers where to go, who to see, to sell military.

DESIGNED to carry out Defense Secretary Johnson's promise to keep five percenters out of the Department of Defense, a Military Procurement Information Office has been opened at the Pentagon in Washington. The center directs businessmen to the appropriate offices in the Army, Navy, or Air Forces which may be in the market for their products or services. It does not assist in obtaining contracts nor will it provide technical or other information concerning contractual matters which is properly in the sphere of the procurement branches of the Services.

The new office may be utilized by personal visit, telephone, wire, or mail. Manufacturers not located close to Washington will be referred to near-by field offices interested in purchasing their product.

Of particular interest to the chemical industry is the centering of large-scale purchasing of most chemicals and chemical products for which Government specifications exist in the Chemical Corps Procurement Agency at the Army Chemical Center, Maryland. The Army has been streamlining its procurement system since early in 1947. As a result, the Chemical Corps now procures many items which were formerly purchased by other commands. Some important changes are:

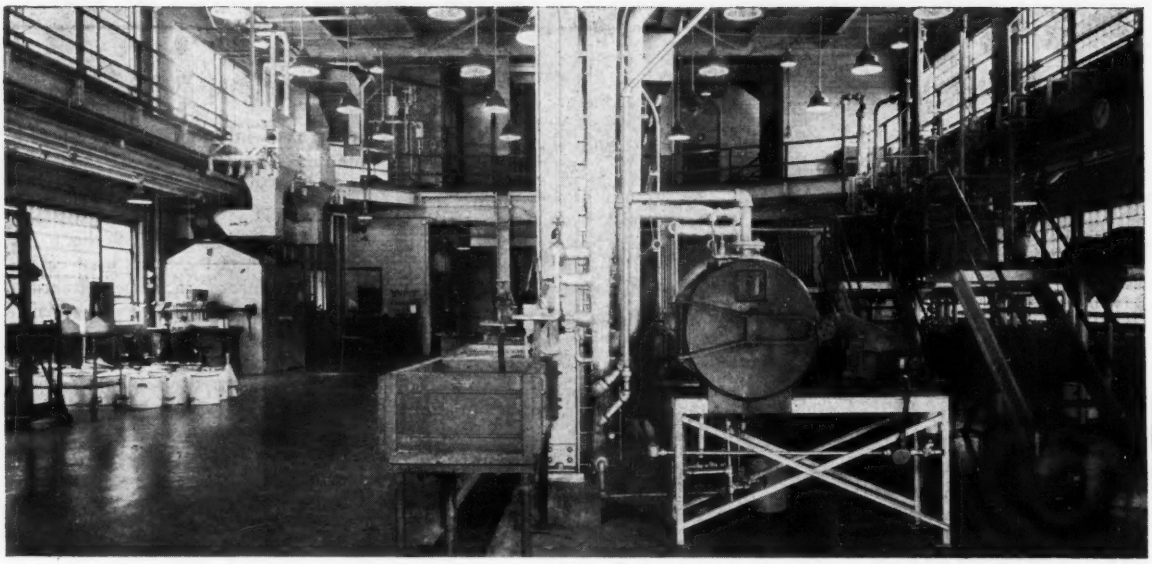
From the Signal Corps

Acetone	Formaldehyde
Alcohol, ethyl	Freon, chlorodifluoromethane
Alcohol, methyl	Freon-12
Aluminum oxide	Pentachlorophenol, sodium salt
Ammonium chloride	Soda, bicarbonate
Ammonia water	Sodium carbonate
Calcium chloride	Sodium silicate
Camphor	
Ferrosilicon	

From the Engineer Corps

Acetylene	Methyl chloride
Ammonia gas	Nitrogen
Calcium carbide	Oxygen
Calcium chloride	Potassium hydroxide
Carbon dioxide	Potassium permanganate
Freon	Silica gel
Hydrogen	Sodium cyanide
Mercury	Sodium hydroxide
Methanol	Sulphur dioxide

While many other chemicals and chemical products are purchased by the Chemical Corps, some are still purchased by other departments of the Army. Full details are to be found in the pamphlet "Purchased Items and Purchasing Locations of the Department of the Army" available from the Procurement Information Center Office of the Assistant Secretary of the Army, Pentagon Building, Washington 25, D. C. A similar publication, "A Guide for Selling to the United States Air Forces," may be obtained from the Director of Procurement and Industrial Planning, ODCS/M, Headquarters, U. S. Air Force, Washington 25, D. C.



1.—Utility lines down the center of the pilot plant divide it into two work areas.

Maximum Safety, Utility Govern Lilly's Pilot-Plant Design

by JOHN H. WALDO and GAIL L. SHAW
Eli Lilly and Company, Indianapolis, Ind.

TWO CRITERIA WERE GIVEN FOREMOST CONSIDERATION in the planning for Eli Lilly and Co.'s new organic chemical development facilities: maximum flexibility in equipment use and utmost safety for the operating personnel.

SINCE there was recognition of the need for a development group for the proper conduct of Eli Lilly and Co.'s organic chemical research and manufacture, a building housing an appropriate pilot plant was designed and erected. The functions of this group are much the same as have been frequently described—particularly well in the symposium on pilot plants at the 113th American Chemical Society meeting.[1] In addition to the normal pilot-plant development of new products, there is the need for trouble shooting on production items, "prep" work in varying scale for items being tested experimentally, and investigation of improvement possibilities for production items.

Since all of the company's problems deal with organic compounds, it has been found desirable to use a personnel of both organic chemists and chemical engineers. With the obvious diversity of work as outlined above, the building houses not only the pilot plant proper but includes standard laboratories for small-scale work and a "prep" laboratory for intermediate-scale work in glassware. Since this type of design has become quite standard in recent years, no detailed description is included.

Much study was given to two important factors which are worth detailing in this article: provision for maximum flexibility in the use of pilot-plant equipment and consideration of requirements for utmost safety in all respects. The pilot plant area is constructed at ground level with a roll-up door at the rear, which is 9′ wide by 8½′ high. This provides adequate space for admission of all equipment and materials. The area, 58′ wide by 95′ long, is divided into two work areas as shown in Fig. 1. The open vertical working area is 24′, and a 5′-wide mezzanine surrounds the area with an interconnecting center strip at a height of 13′. Utilities are brought into the building at the rear. They run down each side under the mezzanine floor and represent the division of the total space into the two areas mentioned above. These utility lines are tapped at regular intervals with appropriately valved outlets. This permits easy connection to pieces of equipment through high-pressure steam hose and quick couplings, which in most cases are made portable (Fig. 2).

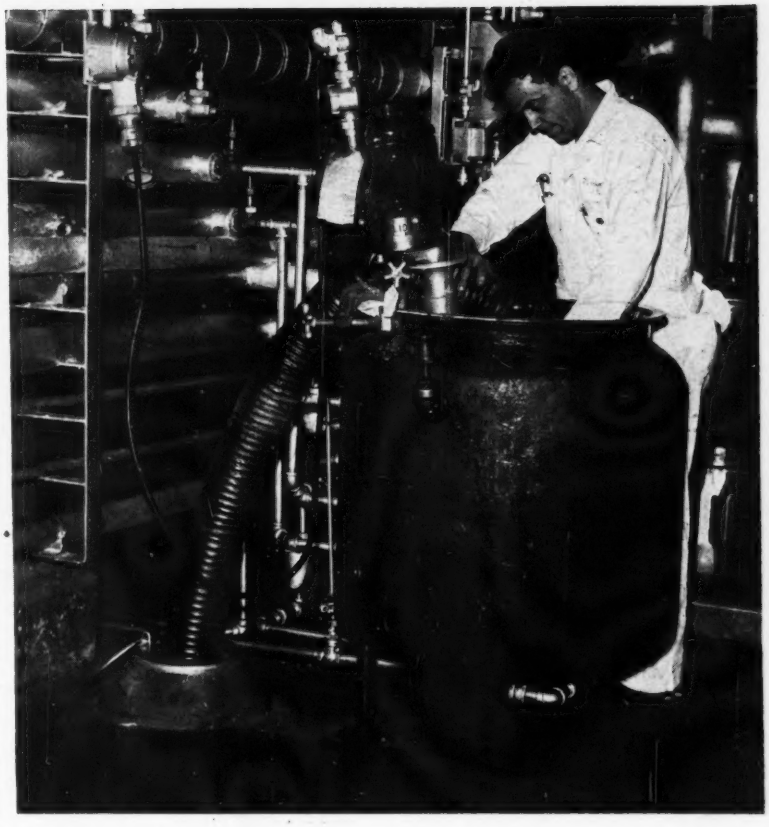
INTERCHANGEABILITY

Since a major part of our work lends itself to fairly standard equipment setups, reactors are mounted on platforms 5′ 5″ high (Fig. 3). These are of 30- and 100-gal. sizes, made in each case of stainless steel and glass-lined steel They are jacketed, agitated vessels and may be connected interchangeably to the necessary utilities for heating and cooling. The reactors are connected, as needed, to condensers of varying size and material. Condensers are generally tube bundles of copper, stainless steel, or carbon, but they also include packed sections of glass-

lined steel and tantalum. The platform mounting permits use of portable auxiliary pieces under the reactors, as the reaction conditions may require. Fig. 4 shows many of these pieces, which may be recognized as earthenware Büchner funnels of varying sizes, jacketed and unjacketed pots of varying design, a stainless-steel plate and frame filter press, and numerous types of pumps. When closed reactors are not necessary, two or three other jacketed open vessels are in fixed position. These, too, may be variably connected to the heating or cooling agents supplied. Agitation for these and the portable pieces, when needed, is obtained by means of portable mixers. Other special fixed pieces include a rubber-lined centrifuge with perforate and imperforate baskets. Variable basket speed is controlled by a Thymatrol motor, which permits more complete study of centrifuging requirements.

For studying drying problems, there are provided a circulating hot-air drier, with careful controls on temperature and humidity; a rotary vacuum drum drier, which can be used equally well for studying flaking problems; and finally a pilot-size spray drier and dry room.

Higher temperatures than are obtainable with 100-lb. steam are made available from an electrically heated Dowtherm unit. Since the entire pilot area is equipped with explosion-proof facilities, the Dowtherm unit is located in a separate room adjacent on the outside.

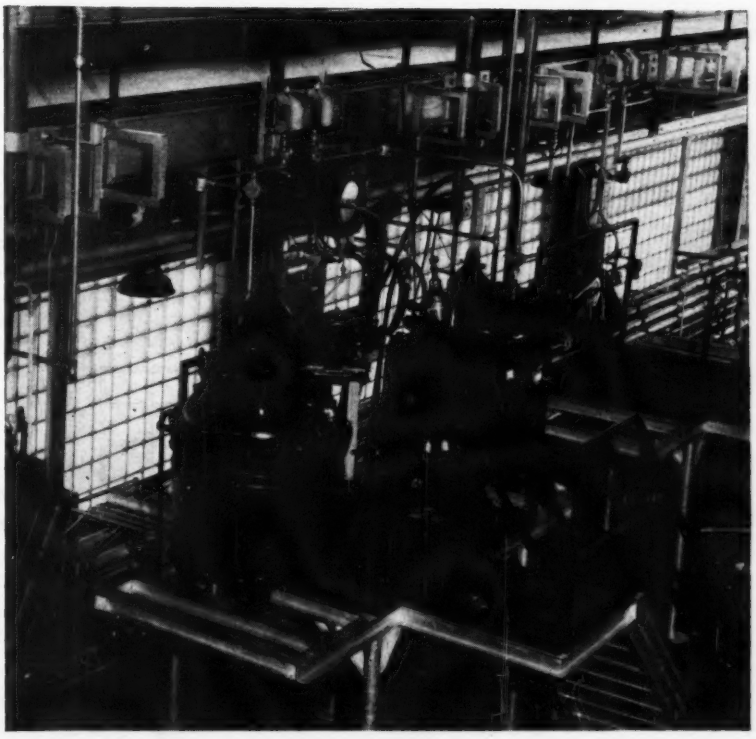


2.—Outlets at regular intervals for various utilities provide easy connections to pieces of equipment through high-pressure steam hose and quick couplings, which are usually portable.

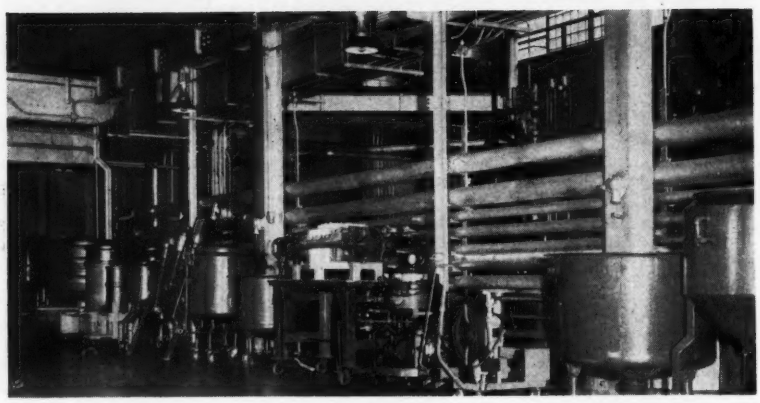
SAFETY WITH SOLVENTS

In our considerations for construction of this building, safety was given a high priority. In addition to having all electrical fixtures meet Class I, Group D, hazardous location requirements, several special features were adopted. A grounded patch of conductive cement is located at all entrances to the pilot-plant area. This, of course, is to remove any static charges from personnel and equipment entering the area. This possible spark source represents, in our minds, one of the greatest potential hazards for ignition of flammable vapors.

Volume use of flammable solvents is fairly small. Storage of these items, therefore, is in 55-gal. drums, kept in a special storage room. The room is ventilated for continual removal of vapors, but there is a fusible link in the vent line so that any fire would immediately stop the fan and close the duct. The only entrance to the room is ramped so that the floor area will hold the contents of two full drums before any spillage through the doorway occurs. All drums are mounted on rocker drum dollies, which permits safe loading and portability. The wheels on these dollies, as on all other portable pieces, are made of sparkproof material. All drums are connected to a positive ground by a flexible



3.—Reactors are mounted on standard-height platforms and connected, as need be, to condensers of varying size and materials. Portable auxiliary pieces are accommodated under reactors.



4.—Auxiliary units, mounted on wheels for mobility, include such pieces of equipment as earthenware funnels, jacketed and unjacketed pots, filter presses, and many kinds of pumps.

clipped-on conductor. When any solvent is being transferred from these drums to any other container, the two are connected by a second clipped-on conductor. This precludes building up static charges, which could result in a spark discharge that might start fires. Drums of flammable solvents are permitted in the pilot area only long enough to charge reactors or kettles. No storage is allowed.

Standard safety equipment, such as gas masks, CO_2 and foam fire extinguishers, fire blankets, and showers, are provided in adequate quantities and at appropriate locations throughout the area. Exits from the area are provided from three of the four sides on both the ground and mezzanine levels.

VENTILATION

Adequate ventilation is another important requirement for safety to personnel. Our procedure has involved constructing two underground vent ducts in the immediate vicinity of the two main work areas. At appropriate intervals, there is an outlet from this duct to floor level. The outlet is covered with a hinged lid which can easily be turned back. A piece of 4" flexible hose is dropped into this opening, and the other end is directed to the spot requiring ventilation. One or more such hoses can be used as needed (Fig. 2). The fan used in this vent system has a capacity of 7500 c.f.m. at 1450 r.p.m., and blades, shaft, and housing are all rubber-lined.

All experimental high-pressure equipment is housed in a separate, specially constructed building (Fig. 5). This building houses four separate units varying from 1-l. to 5-gal. capacities. They are all heated electrically and, with one exception, are stirred with agitators through appropriately designed packing glands. All operations are instrument controlled; and the instruments and operators are outside the pressure area. This area is enclosed on three sides with heavily reinforced 8" concrete, while the ceiling and back side are covered completely with a 5/8" woven cable explosion mat. Beyond the explosion mat are a standard wooden roof and a folding-type garage door, representing frangible portions which can break without hazard to personnel. Explosion waves, however, are not visualized from work of a nature encountered so far.

It is felt that our design in these buildings has resulted in adequate flexibility and safety for satisfactory pilot-plant operation in the manufacture of organic compounds.

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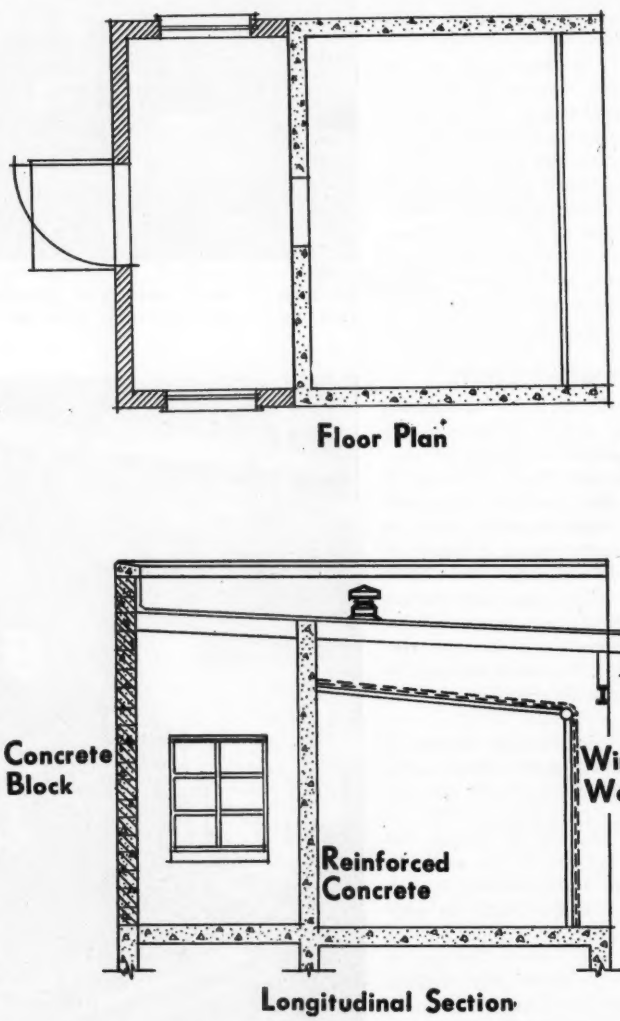


5.—Floor plan and longitudinal section of high-pressure laboratory, showing rigid protection on three sides and frangible portion, behind and above, which reduces hazard to operators.

Should Chemicals Move by Pipeline?

by JAMES H. BOYD, Consultant
New York, New York

PRELIMINARY EXAMINATION DISCLOSES that the very small pipelines required for carrying chemicals probably would not reduce present transportation costs. However, continued expansion of the industry, coupled with further freight rate increases, could easily change this conclusion.

THE volume of chemicals moving long distances to markets is constantly increasing, particularly from the Southwest to the North and Northeast. For example, Shell Chemical Corp. has established a terminal at Sewaren, N. J., to distribute products moved to that point by tankship from Texas; Celanese Corp. is distributing Texas-produced formaldehyde from New Haven, Conn.; Dow Chemical Co. is distributing materials made at Freeport, Texas, from Cincinnati, Ohio, which reach there via barge on the inland waterway; E. I. du Pont de Nemours & Co. distributes Texas-produced methanol from Belle, W. Va.; and Southern Alkali Co. distributes caustic and chlorine produced at Lake Charles, La., through the Columbia Chemicals Div. of Pittsburgh Plate Glass Co. at Natrium, W. Va.

An obvious question is why not follow the example of the petroleum industry and set up a products pipeline to carry chemicals, possibly with intermediate slugs of hydrocarbon solvents or fuels to build up the volume and reduce the unit cost? Further, why not place caustic soda in solution and pump it from the Southwest where there is a huge oversupply?

PRODUCTS LINE

The greatest obstacle to the success of a chemical pipeline is the extremely high percentage of the total cost (usually 70-80 per cent) represented by fixed charges such as taxes and depreciation on small diameter lines. Thus a pipeline must operate at full capacity if costs are to approach their most reasonable level.

Another major problem is to locate a sufficiently large supply of chemicals for transport. For example, a three-inch products line with only four pumping stations in its thousand mile length can handle about 85 million pounds of products per year. The mere addition of four more pumping stations would raise the carrying capacity to about 150 million pounds per year. There are not many liquid chemical products which are available for transport in such huge quantities. Methanol, isopropanol, acetone, and styrene are possibilities. These and other chemicals could conceivably be slugged through a pipeline, as is done with petroleum products. However, contamination problems would be more critical.

(*Turn to page 461*)

COST TO BUILD AND OPERATE A 1000-MILE PIPELINE

	30% NaOH at 68° F.			Mixed Product
	4" line	5" line	6" line	3" line
Estimated Capital Cost				
Cost of line laid in ground (a)	$7,200,000	$9,000,000	$10,800,000	$5,400,000
Pumping equipment	835,000	1,042,000	1,253,000	626,000
Tanks	731,000	914,000	1,097,000	549,000
Buildings	521,000	653,000	785,000	392,000
Other	1,150,000	1,430,000	1,724,000	863,000
Total Cost	$10,437,000	$13,039,000	15,659,000	7,830,000
Working Capital — line holdup (c)	292,000	454,000	655,000	605,000
Total Capital	10,729,000	13,493,000	16,314,000	8,435,000
Line Capacity — tons 100% NaOH/year	87,500	87,500	182,500	42,500 tons products/year.
Pumping Stations (b)	31	10	8	4
Estimated Operating Cost				
1. Direct labor — 4 men per station 160 hrs. per wk. at $1.50 per hr. 8 hrs. per wk. at $3.00 per hr.	$ 425,000	137,000	110,000	
2. Direct labor — 2 terminals equals 2 stations	27,400	27,400	27,400	(1+2) 82,500
3. Line Walking — repairs and maintenance $12/in./mile/yr. (a)	48,000	60,000	72,000	36,000
4. Supervision — 20% of 1, 2, and 3	100,000	45,000	42,000	16,500
5. Power — Direct Pumping $0.007 per KWH, 80% power factor. Miscellaneous—10% of above	163,000	52,600	92,000	5,060
6. Supplies 10% of 5 but not under $1000	16,000	5,300	9,000	1,000
7. Maintenance — exclusive of line 10% on pumping equipment, 5% on other	203,500	254,000	305,600	152,800
Total Direct Cost	$ 982,900	581,300	658,000	293,860
Depreciation — 5% on fixed capital (d)	522,000	675,000	783,000	392,000
Taxes — 4% on fixed capital (d)	417,000	522,000	626,000	313,200
Insurance on above ground equipment (d)	16,200	20,200	24,300	12,200
Interest 4% on total capital	429,200	540,000	652,600	337,400
Total Indirect	1,384,400	1,757,200	2,085,900	1,054,800
Grand Total	2,367,300	2,338,500	2,743,900	1,348,660
Cost per Ton	$27.10	$26.70	$15.05	$32.00

(a) Reasonable cost of line laid in the ground is $1800 per mile per inch diameter of pipe. Line walking, repairs and maintenance average $12 per inch per mile per year.
Some total figures on pipeline investment, taxes, maintenance, etc., are given by John E. Boice, Oil & Gas, Sept. 20, 1949, pg. 228. This same article breaks down the total investment to pipeline laid in ground 68.4% of total investment, pumping equipment 7.9%, oil tank 6.8% and buildings 4.9%. These figures include all lines, a fair fraction of which must be threaded pipe. Modern practice of welding line pipe permits use of thinner wall pipe with consequent increase in capacity per ton of steel used, particularly in the smaller sizes of pipe.

(b) The estimate of the number of pumping stations required is based on pressure drops accumulated from the tables in Loyal Clarke's "Manual for Process Engineering Calculations," McGraw-Hill, 1947. Power requirements were calculated using formula given by W. L. Nelson, Oil & Gas, Sept. 30, 1948, pg. 103.

(c) Working capital for the pipe line was assumed to be the value of the product in the line hold-up.

(d) Depreciation and taxes were taken as 5% on fixed capital and 4% on fixed capital respectively based on the Boice reference cited above. Insurance was taken as being ½% per year on the value of the above ground equipment. This also may be high. Although not adequate to stimulate investment, interest was taken as 4% of the total capital employed.

Exterior of Atlas Powder's new food and pharmaceutical emulsifier plant. Shipping platform and rail siding are at the rear.

New EMULSIFIER PLANT Stresses Versatility

by HOWARD C. E. JOHNSON, Managing Editor

CLEANLINESS AND VERSATILITY mark Atlas Powder Co.'s new plant for producing a family of food and pharmaceutical emulsifying agents.

JUST ten years after the first Span emulsifier (sorbitan fatty acid ester) was developed, Atlas Powder Co. started construction of a plant at Atlas Point, just outside of Wilmington, Del., to produce a large family of brothers, cousins, and more distant relatives of the original progenitor.

The present major products fall into three broad categories to which the trade names Span, Tween, and Myrj have been given: The first group consists of sorbitan fatty acid esters; the second, polyoxyethylene derivatives of the Spans; the third, polyoxyethylene esters of fatty acids. A fourth group, to which no trade name has been assigned, consists of partial esters of polyoxyalkylene derivatives of the hexitols—essentially the same elements as the Tweens but reacted in a different order.

Since in the manufacture of any of these groups the raw materials can be combined in any ratio—and often to any degree of completion—it is evident that an infinite number of products can be prepared. It is possible, however, to cover the range of emulsification requirements (*CI, Nov. 1948, p. 764*) with a relatively small number of products—small, that is, compared with infinity, but still a sizable number. Since many of these products are designed for specific custom requirements, as many as 150 emulsifiers, mixtures and compounds are regularly manufactured.

Production scheduling, therefore, is a major problem at the new derivatives plant; and this problem was anticipated in the design of the plant, in which versatility of equipment and provision for orderly growth were kept foremost in mind. The new unit is set upon a large area of land which provides for the ultimate erection of similar integrated units as demand increases.

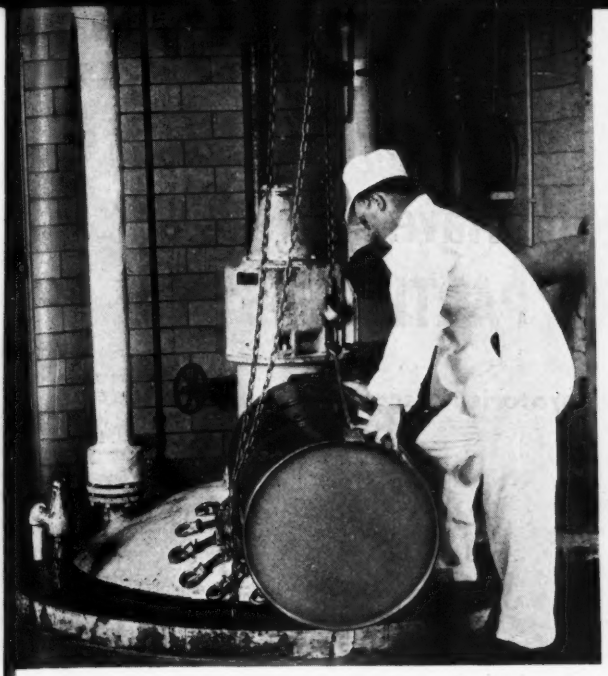
Raw materials required are long-chain fatty acids (chiefly stearic, oleic, palmitic and lauric), polyols (esp. sorbitol, less often mannitol) and ethylene oxide. Fatty acids are received in tank cars and discharged into a heated storage tank. Minor quantities are received as bagged solids and stored in the receiving area.

Sorbitol is conveyed by tank truck to a large storage tank in the receiving area from Atlas' nearby unit, where sorbitol is manufactured by electrolytic or catalytic hydrogenation of glucose (*CI, Oct. 1947, p. 618*). Ethylene oxide is stored outdoors in tanks.

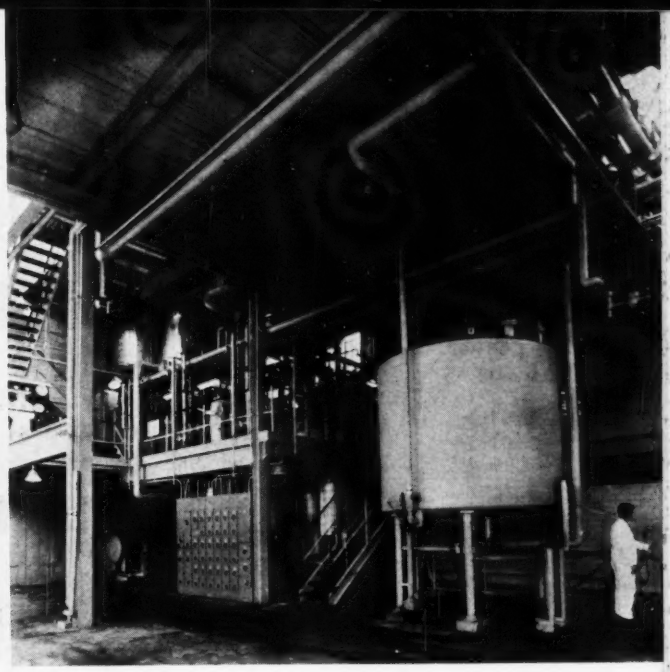
SPAN PRODUCTS

Raw materials for Span products are mixed in the proper proportions, together with catalyst and other processing ingredients, in a stainless steel loading tank equipped for heating to melt solid ingredients. The loading tank is in the receiving room—separate from the processing area.

The batch is then transferred up to a jacketed stainless steel reaction kettle which is equipped with a stirrer and is heated by Dowtherm vapor. The reaction may be carried out at atmospheric pressure or under vacuum. When the reaction is complete, the charge is dropped by gravity to a cooling tank whence it is fed to a filter press located in the basement to prevent contamination of the processing area. The filtrate is then pumped to a treating tank for decolorization and deodorization, and for any other special treatment required. It is again



Loading tank is on scales to weigh up batches of raw materials.



Reaction section is in separate room to facilitate cleanliness.

clarified by filtration. It is held in a suspense tank until complete analyses are run, and it then goes to a storage tank. Final liquid products are loaded into drums or tank cars or trucks, and solids are either poured molten into fiber or open-head steel drums, or else sprayed into powder form and weighed into fiber drums.

The spray tower operates on the principle of the old-fashioned shot tower. The molten product is sprayed downward through a nozzle counter-current to a rising current of washed, water-cleaned, cool air. The small drops solidify en route and are collected at the bottom of the tall tower as small spherical particles. Drummed products are handled on pallets by motorized equipment in the shipping room, as are drummed or packaged raw materials in other parts of the buildings.

Drums of finished products are handled on pallets by lift trucks in shipping room.

TWEEN AND MYRJ PRODUCTS

Part of the Span production is used, of course, as raw material for the production line in the opposite wing of the building, where the Tween and Myrj products are made. Here Span (or fatty acid) is weighed into a loading tank and pumped into an autoclave located outside of the building, where it is reacted with ethylene oxide. The temperature of the reaction is automatically controlled, provision being made for manual control in case the automatic controls fail.

The autoclave itself is equipped with several safety valves and a rupture disk if the reaction should get out of hand.

Ethylene oxide reacts directly with either free hydroxyl or carboxyl groups, replacing the hydrogen of either group with an oxyethylene group, on the end of which a new primary hydroxyl group is formed. Additional ethylene oxide molecules will react with this terminal hydroxyl group, building up polyoxyethylene chains always ending in a hydroxyl group. No water is used or formed by these reactions.

The batch is pumped from the autoclave to a treating tank for decolorization and deodorization, after which it is filtered and held for analysis in similar equipment and in a similar sequence of steps as used for the Span products.

Carbon dioxide, used as an inert atmosphere in the reaction vessels to prevent oxidation and darkening at elevated temperatures, is stored in an 8-ton tank, refrigerated to relieve the necessity of extremely heavy construction. Since rapid withdrawal of carbon dioxide is likely to lower the temperature and pressure too far, steam heat is automatically supplied to the container when the pressure falls below a predetermined point. Refrigeration is likewise cut in automatically when the pressure exceeds a predetermined amount.

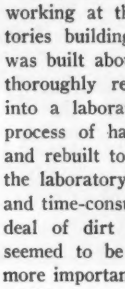
Partly because of the variety and number of batches, and partly because of the necessity for strict reproducibility, recording instruments and automatic control devices are used wherever possible. Charts and other data are filed together by batch number, permitting accurate control over the major analyzable properties, such as titer or viscosity, saponification value, acid number, and hydroxyl number.

Since most of the products of this unit are destined for food or pharmaceutical use, special attention has been given to cleanliness. The materials are in an entirely closed system from the time they are weighed into the loading tanks until the final products are packaged. Nevertheless, the concrete floor and tiled walls were designed for easy and thorough cleaning, and stainless steel was chosen for the process equipment to prevent contamination.

The new plant was necessitated by the growing acceptance of these emulsifiers as adjunct ingredients in a variety of products, including pharmaceuticals and foods. Atlas anticipates a continued expansion of these markets.

Should Your New Laboratory Have MOVABLE or STATIONARY PARTITIONS?

Two directors of research laboratories discuss the merits of each.



MOVABLE PARTITIONS

by RALPH BOWN, Director of Research
Bell Telephone Laboratories, Inc., Murray Hill, N. J.

THE theory or principle of movable partitions is pretty well accepted. Such partitions are in use in many laboratories today.

One of my first experiences with laboratory construction problems came while working at the Bell Telephone Laboratories building at 463 West St., which was built about 1898. It had been pretty thoroughly reorganized from a factory into a laboratory and was in continual process of having the walls torn down and rebuilt to suit the different needs of the laboratory. This was very expensive and time-consuming and produced a great deal of dirt and trouble. However, it seemed to be necessary; the work was more important than the building.

This experience had its effects. When a new laboratory was contemplated, a committee appointed to study the problem worked long and arduously and developed a plan for a laboratory which had no internal fixed walls. The laboratory, located in Murray Hill, New Jersey, was built in 1940. It has been lived in now for nearly eight years. A second one of about equal size and constructed in accordance with the same principle is just going into use.

When I saw the plans and the finished construction, I was extremely skeptical. The construction, while very flexible, seemed perhaps too complicated in allowing for more things than any one area would be called upon to do. I have worked in this laboratory now about three years and have completely changed my point of view.

The first problem that I met was this: A piece of work would progress to a point where it should go to some other group. Formerly, if you took a map of the floor and spotted in the departments in different colors, each floor and each part of each floor would look like a kaleidoscope. Every department was contiguous to every other department. It was all mixed up and there seemed to be no possible way of keeping things unified. In the new building I decided that if some work which involved an occupancy in the middle of a group must go to another department, it should be repackaged so we could still remain contiguous. I found this actually could be done. It worked the first time we tried it.

After the war we started out blithely to construct a new addition to the building. We ran into many delays as so often happens in this kind of job. When we came to move into the laboratory we found that there had been so much change in the planning of the work, so much development in what was going on, and so many rearrangements of organizational groupings that many of our plans had to be revised. Fortunately, all that was wasted was paper work and a certain amount of planning time, because nothing had been put in which was permanent. That one experience paid off in a very big way.

When we occupied the first unit before the war, we established ourselves by moving to the new laboratory appropriate parts of each of several departments in order to get experience, particularly with controlling departments which were split in their geographical location. This meant that as we moved more departments to the new location we rearranged some which already had been moved in order to locate them relative to other groups in a way different than they had been before. We are now rearranging approximately 75% of the entire space at Murray Hill; 50% of it is new layout which is revised from the original layout of two years ago; 25% of it is rearranging the 50% which has been there for eight years. The whole place is in a state of flux, yet the change is being made with an astonishing amount of freedom from noise, dirt and disturbance, and with an amount of facility which has saved us much time. This experience has completely dissolved any skepticism I had about movable partitions.

We use a standard module—a standard unit of space—at Murray Hill, which in multiplication produces the total floor area. This concept has been named "universal space." The idea is that any space is as good for one purpose as any other space, and, therefore, is universal in its applicability. If you combine the universal space principle with a standardized unit movable partitioning, you arrive at a flexibility which enables almost anything to be done.

There is, of course, the question of cost. The kind of partitioning we have used in our laboratory is one that is suited to handling in a large panel. It is made of steel and packed with rock wool. This partition, installed, costs somewhat more than a fixed and completely finished four-inch tile and plaster partition. Our building engineer says that the extra cost is practically erased after one moving, because there is substantially 100% recovery on the material.

Another factor is the appearance of these partitions after they have been in use for some time. They are washed from floor to ceiling whenever the housekeeper thinks they need it. It is only after some mechanical damage, such as scratches, that we refinish.

A considerable number of gadgets have been evolved (some in our own laboratory and some by the manufacturer) whereby almost anything can be hung on the wall. Shelves can be mounted, wire races can be put either inside or outside the partitions, and it is often handy to attach papers with magnets. As far as I know, there have been no problems of occupancy which have not been solved in a sightly manner.

There also is the question of sound insulation. The heat insulation is good. It has been no problem. The sound insulation is marginal, particularly in a quiet location such as we have. However,

Condensed from papers presented by the authors before the Industrial Research Institute, Inc., May, 1949.

we have found that some of the sound transmission occurs not through the partitions but through channels in the hollow walls of the outside construction, which are arranged for piping, etc., and which were not properly plugged. These channels are being plugged as occasions arise.

STATIONARY PARTITIONS

by R. S. ROSE, JR., Director
Central Research Laboratory, Atlas Powder Co., Wilmington, Del.

FOR the purpose of this paper I shall assume that fixed partitions are better than movable ones and I shall give you my reasons to support that position. Since I have had no experience with movable partitions, my remarks are based on experience at our laboratory where we have fixed partitions.

The Atlas central research laboratory, which is a chemical laboratory (and I think that has something to do with the possible choice of construction), consists of three buildings. The first was built in 1943, the other two in 1945. We have fixed partitions in all three, and we have found them very satisfactory.

The first building, or main laboratory, is two stories high. It contains ten laboratory rooms, administrative offices, library, storerooms, constant temperature humidity room, and a physical testing room for protective coatings. The second building is a hydrogenation laboratory, and the third is a semi-works, or pilot plant building.

In designing the buildings we attempted to plan each room, based on expected personnel, equipment and type of work to be done, and then fit these into the over-all building dimensions. We feel that this method has worked out quite satisfactorily. For future expansion we have a considerable amount of ground, and it has been our idea that new buildings will be added.

The first building consists mainly of laboratories and offices, and would be most susceptible to the module plan and the use of movable partitions. The hydrogenation laboratory and semi-works building were designed for special purposes, and, in our opinion, do not lend themselves readily to any kind of treatment except fixed partitions.

In our first building we made mistakes in our attempt to plan each room for the work we expected to do in it. We attempted to correct some of these mistakes in the construction of the other two buildings. We found, for example, that the dimensions of the small laboratories (14′ x 20′) in the first building were far from ideal. In these rooms, wall type laboratory benches were placed along the long dimensions. This left nine feet of space in the middle, which is too much for an aisle and not enough for a center bench. It allows only a narrow table—about three feet across—leaving two three-foot aisles. Those three-foot aisles are sufficient if the table is being used only for equipment or materials which are not in use generally and are transferred to the side laboratory benches. If you attempt to use the table for actual daily working space, the three-foot aisle is entirely too crowded. This condition was corrected in the semi-works laboratories and offices by making them 18′ x 18′, which gives ample width for two side benches and a center bench, or for two rows of office desks.

As to the relative advantages of fixed partitions versus movable ones, the first thing that comes to mind is a question: Are the movable partitions really desirable? According to Mr. Bown they are. In the five years that we have occupied our main building, the number of chemists, not counting laboratory assistants, has increased from eleven to twenty, and the scope and distribution of our work by groups has changed markedly. Yet in all that time there has not been a single instance when anybody has wished we were able to move a partition.

In our opinion, movable partitions are desirable only under special conditions. When a large laboratory is being built, if a great increase in personnel is anticipated and there is a possibility of many changes in the scope of the research work or equipment, it may be beneficial to design it with movable partitions.

An argument in favor of fixed partitions is lower cost. In our case that was a major factor. Where a variation in wall construction or finish is desired, it can be easily supplied. It is presumed that for movable partitions a single design of construction, materials and finish must be employed throughout. The partition walls in our laboratory rooms are four-inch hollow tile, glazed on both sides. The present cost of such construction is about $1.15 per sq. ft. in place. In the offices and library, plaster on unglazed tile is used. Between office and laboratory, the tile was glazed on one side and plastered on the other. The $1.15 cost figure is an approximation and applies to any of the three variations that we have used.

The tile surface runs from floor to ceiling, and we have found it very satisfactory. It is easy to keep clean, does not show stains, and is quite permanent. Our painted plaster walls can be easily washed and repainted.

The use of fixed partitions avoids the need for special planning of service piping. On a module basis with the movable partitions, it is conceivable that you may put in surplus service connections in order to preserve the flexibility of the operation, and this will create a considerable increase in the basic cost. It is also conceivable that those partitions will never be moved and a great many of the service connections will never actually be piped up.

With fixed partitions a greater variety of arrangement of equipment and laboratory benches is possible. In one of our analytical laboratory rooms, for example, we tried to plan so that each foot of space was actually in use. We have two center benches in it, and around the entire four walls, exclusive of the doorway openings, we have working space consisting of laboratory benches, shelves, cupboards, and permanently placed equipment. We do not feel that this would be possible if movable partitions were used in all cases.

In our laboratory we have found it to be very convenient to be able to fasten equipment to the walls, even rather heavy pieces of equipment, and especially to construct shelves on the partition walls. When the laboratory furniture was selected, we thought that we had planned properly for sufficient cupboard, storage, and shelf space. We later found that we had underestimated our requirements.

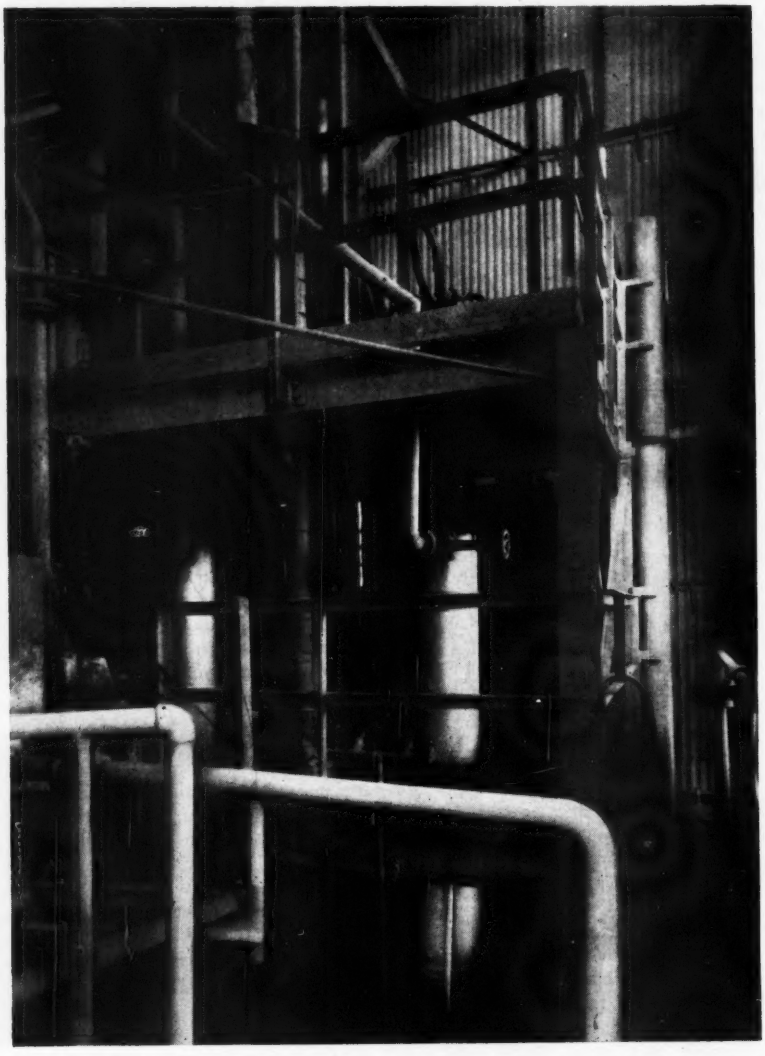
The use of fixed partitions allows for tight joints between walls and floor. Therefore, any spills or leaks in one room are confined to that room; vapors or fumes in one room do not move into the next.

A variety of floor covering is possible when fixed partitions are used without disturbing the color scheme. If movable partitions are used and a partition is taken down between two varieties of floor coverings, it will be noticeable and, possibly, undesirable.

Making special rooms, such as a constant temperature room or a room with special acoustical features, out of existing rooms would seem to be easier where solid fixed partitions are employed.

To summarize, the principal advantages of fixed partitions appear to be lower cost, avoidance of need for special arrangement of service piping, and allowance for a greater variety and arrangement of laboratory equipment.

The major disadvantage of fixed partitions is that they require careful planning in advance. However, this disadvantage is not as great as some may imagine, since in our five years' experience we have had no occasion to want any room size changed.



Twin Karbate absorbers and tails tower. In right background is part of combustion chamber.

HYDROCHLORIC ACID On a Production Line Basis

by C. W. CANNON, Vice President
Frontier Chemical Co., Denver City, Texas

CONTINUOUS STRAIGHT LINE FLOW from brine well to product delivery, with no intermediate storage, contributes to efficiency in Texas HCl plant.

OF THE hydrochloric acid producers in this country, the number making the acid as a desired end product is small. Most of it is obtained as a by-product of organic syntheses involving chlorination.

Frontier Chemical Co. at Denver City, Texas, is producing the acid direct from chlorine and hydrogen as one of its major products in a plant designed specifically for this purpose. Its location in West Texas enables it to draw all of its raw materials and operating needs from its own vicinity and to market practically all of its products in the immediate area.

The raw material and marketing attributes are, of course, the reasons for the location of the plant, and logically, this situation contributes much to the company's economic position in a highly competitive industry. Current operations indicate a gross business in excess of a million dollars annually and are evidence that a carefully investigated potential market is being served satisfactorily.

The plant is located centrally to West Texas and New Mexico near the interstate border. The area comprises the oil-rich Permian Basin, the potash lands of New Mexico, and is popularly known for the huge caverns at Carlsbad, N. M. The Permian Basin contains an underlying salt stratum ranging from 200 to 1,000 feet in thickness, averaging about 600 feet under the plant location, from which saturated brine, the essential raw material, is taken. Five water wells and a salt well provide the process raw materials; fresh water is pumped at a rate of 200 gallons per minute to supply the brine well, cooling towers, acid make-up water, and the zeolite boiler feed water softeners. Gas produced with oil underlying the same locality at a depth of 5,000 to 6,000 feet provides fuel necessary for electric power, steam generation and other heat requirements. Electric power is purchased from the Southwestern Public Service Company, only a mile away, and is brought in through a 3,750 kva. substation directly across the road from the plant. The direct current required for the 64 electrolytic cells is converted from the 2,300-volt, 3-phase, 60-cycle, a.c. supply by three motor-generator sets. Frontier Chemical is the fifth largest industrial user of power in the service area composed of eastern New Mexico and northwestern Texas, consuming close to 25 million kwh. per year.

Residue oil field gas from this source is received from the Shell Oil Company's natural gasoline plants in steady abundance to produce process steam and for other process needs. The steam boilers, caustic pots and miscellaneous heating needs consume three-quarters of a million cubic feet per day. Fuel costs are equivalent to $1 per ton coal.

The only expendable items used in the process that must be "imported" are the graphite anodes used in the electrolytic cells, and miscellaneous maintenance materials.

The high production efficiency of the plant is attained by the inherent raw material and marketing advantages. A continuous straight line flow from brine well to delivery, with no storage of intermediate products, contributes to a high degree of plant space economy and simplicity of operation. Sixty tons of 20 deg. Bé. commercial hydrochloric (muriatic) acid and approximately 20 tons of caustic soda are manufactured daily. Caustic soda was originally considered the by-product of

the operation, but sufficient outlets have been developed locally for it to approach the acid in dollar sales volume.

Being somewhat in the middle of West Texas oil fields, which produce about 30 per cent of the United States crude oil, the plant is ideally situated to supply a demand market for commercial hydrochloric acid for acid-treating oil wells. That a large market exists in this area is due to the increased study given to improving the production capacity of wells completed from dolomite or limestones. Much of the recently developed oil production in West Texas and New Mexico, as well as some other localities, is from acid reactive strata.

The main objective in acid treating wells is to increase the permeability and improve the drainage pattern around the bore hole so that the flow of oil to the well will be increased to commercial quantities. Many of the recently developed oil fields have been from horizons considered "dry" prior to development of present day techniques in acid treatment to develop commercial oil flows. Use of acid for increasing gas flows is of equal importance. Treatments involving 500 to 40,000 gallons acid per well are common, with the gas wells generally requiring the heaviest treatments. Acid is customarily used in strength of 15 to 20 per cent along with inhibitors, wetting agents, accelerators, etc., which are themselves substantial items of chemical consumption.

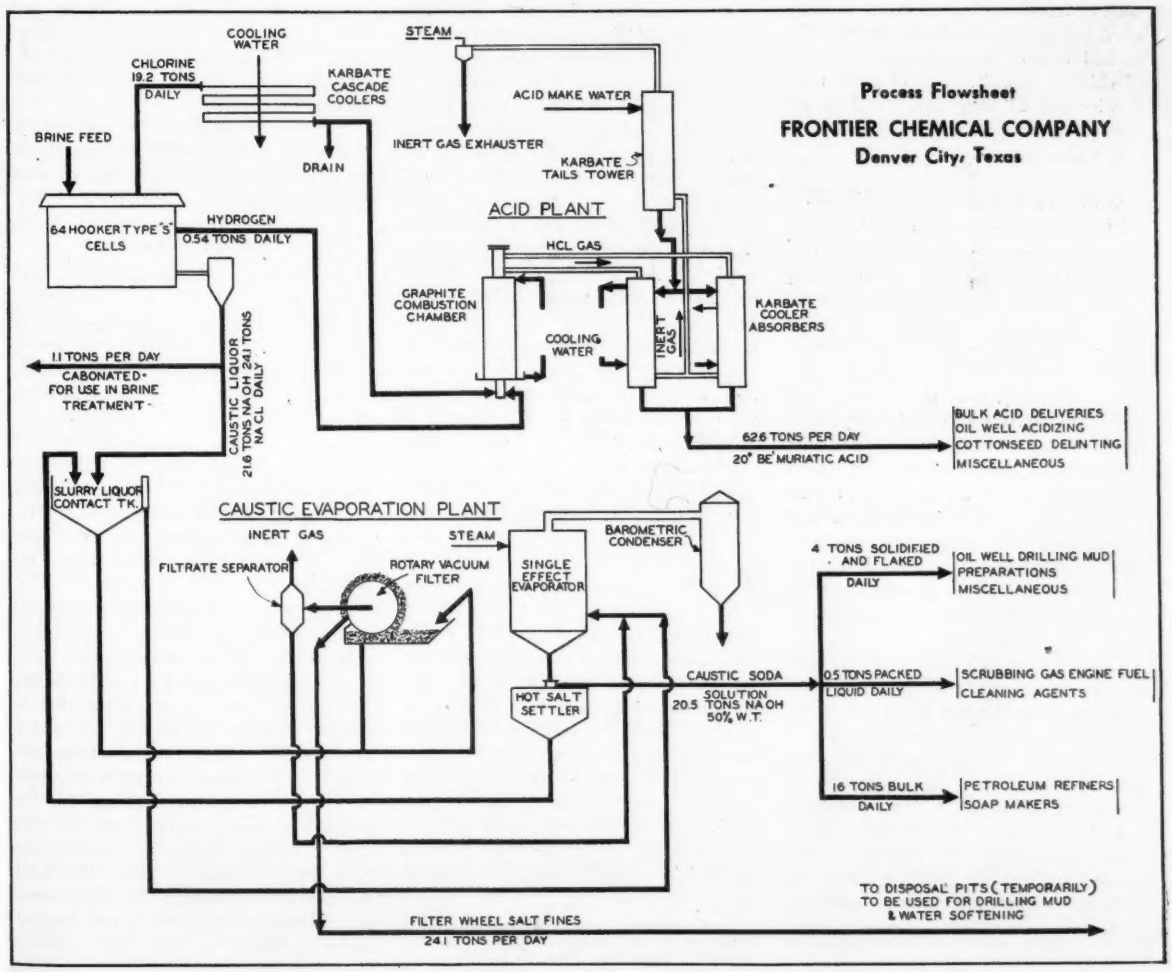
The quest for additional oil reserves and the higher prices now being paid for oil lead to specialized techniques in the drilling and development of the wells. On deep wells (12,000 feet to 17,000 feet) it is not uncommon for the chemical bill for control of drilling muds and completion of the well to be in the range of $25,000 to $50,000.

Caustic soda, the co-product produced in the electrolytic operation, is an ingredient frequently used in controlling viscosity and gas-cutting tendencies of drilling mud. About twenty per cent of the plant's caustic yield is used to supply this local demand. Sixty per cent is sold in the liquid form to the refineries and natural gasoline plants located within a 350 mile radius. The balance is consumed for miscellaneous local uses including potash ore flotation, bleach manufacture, and synthetic rubber production. A small amount is partially carbonated to supply the necessary brine-treating reagents, which makes the plant entirely independent of outside sources for its raw material.

Plans are now in progress to process the 25 tons per day residual salt separated during the caustic concentration for use in salt water type drilling mud and for zeolite water softener regeneration.

Much of the area supplied is not conveniently served by rail transportation. In fact a number of plants served have no rail facilities in the immediate area. The company operates five tractor and semi-trailer type chemical tank trucks, each of which averages about 10,000 miles per month, delivering acid and caustic soda. Deliveries of 15-ton shipments are made up to 600 miles from the plant, and each truck unit is equipped with a pump so that it can be unloaded by the driver. Emergency deliveries which would require from a week to 12 days by rail frequently are made on 6 to 12 hours notice, representing a service that previously was not available.

The plant is located 350 miles from the closest acid plant and 600 miles from the closest caustic manufacturer.



The chemistry of producing commercial hydrochloric acid is simple. Hydrogen and chlorine gases are produced by passing brine through Hooker electrolytic cells. Electrolysis of the brine produces hydrogen at the cathode, chlorine at the anode, and a co-product of caustic liquor. The hydrogen and chlorine then are burned in a combustion chamber and the resulting HCl gas is contacted with water where it is absorbed to produce commercial hydrochloric acid.

Brine production begins by pumping 45,000 to 46,000 gallons of fresh water into the salt well daily under a pressure of 350 psi. Any impurities in the brine are precipitated out by the addition of soda ash and caustic soda and subsequent settling to produce a crystal clear solution containing a 25-26 per cent concentration of 99 per cent purity salt. It is then stored in redwood tanks.

From the storage tanks the brine is pumped into a feed control tank and thence gravity fed on a continuous 24-hour basis into the Hooker Type S electrolytic cells at a rate of 30 gal. per minute and a temperature of 175-180 deg. F. Direct current at 8,000 amps. and 110 volts is fed to one bank of 32 cells, and at 10,000 amps. and 115 volts to the second bank of 32 cells. Electrolysis of the saturated salt solution results in the formation of 0.54 tons of hydrogen gas, 19.2 tons of chlorine gas, 21.6 tons of sodium hydroxide per 24 hour day. Residual salt from the operation amounts to some 25 tons daily.

GRAPHITE COMBUSTION CHAMBER

The chlorine and hydrogen leave the cells at a temperature of 165 to 175 deg. F. saturated with water. After cooling to 125 deg. F., the hydrogen enters the silica burner nozzle located at the center of the bottom of the combustion chamber. The chlorine passes in parallel through two 4" Karbate* five-section Cascade coolers where the temperature is dropped to 125 to 130 deg. F. The original cooler after 2½ years of operation and the second cooler after 1½ years are both in good condition and neither has required any maintenance. The reduction in gas temperatures condenses out a large portion of the water vapor which reduces the pressure drop and the amount of gases handled in the rest of the system.

A 33" I.D. x 38" O.D. x 20 ft. high graphite tower serves as the combustion chamber. Since the gas yields are in almost stoichiometric proportions (plus a small amount of water vapor and inert gas) the theoretical flame temperature approaches 4,000 deg. F. Approximately 5 g.p.m. of water are circulated in a closed circuit over the outside of the chamber to keep the graphite below the oxidation temperature. Silica deposition on the outside of the tower due to the extremely hard well water has been something of a problem. However, when the chamber is shut down periodically about every 8 weeks for maintenance, a large portion of the silica flakes off.

Combustion is started by igniting a hydrogen flame in air on the end of the hydrogen line and then allowing the flame to be sucked into the chlorine filled chamber as the hydrogen line is connected to the burner nozzle. Vacuum in chamber varies between 8" and 10" water. This is sufficient to draw a small amount of cooling water through the walls of the tower, although they are painted with National No. 140 coating compound to reduce the porosity of the graphite. The acid thus formed is drained off and periodically pumped to storage. A 16" I.D. frangible impervious graphite disc is located on the top of and at the axis of the chamber as an explosion precaution. A pair of short 6" I.D. water cooled Karbate pipes convey the hydrogen chloride gas to the twin absorption system. Packed expansion joints designed around impervious graphite sleeves are employed in these lines.

HYDROCHLORIC ACID ABSORBER

A conventional Karbate falling-film type hydrochloric acid absorber[1] consisting of a shell and tube cooler-absorber in which acid and gas flow downward in parallel streams and a tails tower having gas and liquor flowing countercurrently absorb the gases entering at 450 to 500 deg. F. Instead of the usual single unit cooler-absorber, two units in parallel, each containing 30⅞" I.D. x 1¼" O.D. x 108" long impervious graphite tubes are employed. A 16" I.D. x 20" O.D. impervious graphite tower packed with 7 feet of 1½" raschig rings serves as the tails tower. Impervious graphite 4" pipe connects the cooler-absorber and tails tower. The absorber produces 31 per cent acid which flows by gravity to a 30,000 gallon rubber-lined storage tank. Cooling water at 70 to 80 deg. F. is circulated through the shells of the cooler-absorbers at a rate of about 120 g.p.m. in a closed circuit. A forced draft cooling tower maintains the cooling water at 70° to 80° F. during the warm months. Four hundred ppm. plus total solids in the well water supply necessitates a shut down about every 8 weeks for inhibited hydrochloric acid cleaning of the shell side of the cooler absorber. A Karbate pump circulates the cleaning acid. Salts and silica form doughnut shaped deposits around the V-notch Karbate weir liquor distributors on the upper tube sheets, which must be removed periodically.

Vacuum for the entire acid system is provided by a small steam jet ejector at the vent of the tails tower. The duty is light since handling the small amount of carbon dioxide from the cells, plus any air which leaks into the system, is all that is required. Vacuum on the suction side of the ejector is normally in the range of 15" to 25" water. Steam pressure to the ejector is adjusted to maintain a constant ¼" to ½" water vacuum on the chlorine cell header. Since the entire process is carried out under vacuum there is no leakage of fumes from the acid system. From cells to acid storage tanks, there are no moving parts handling gas or acid streams.

During a shut-down the first winter of operation, the tails tower froze, breaking the bottom section in two parts. The pieces were cemented together with National No. 14 cement at the plant and the tower has operated perfectly ever since.

CAUSTIC SODA EVAPORATION

Cell liquor is processed in a single-effect, nickel-clad, circulating type evaporating unit of Buflovak design. All hot caustic lines, pumps, steam chest, etc., are of nickel construction, which enables the plant to produce commercially iron-free caustic soda.

Evaporation is carried to 50 per cent concentration, and the bulk of the caustic is marketed as such. Final cooling and settling takes place in cone-bottom water-jacketed settlers.

The remaining 20 to 30 per cent of production is processed in pots and flaked on a 5,000 pound per hour water-cooled flaking drum.

MAINTENANCE

The problem of maintenance has been reduced to a minimum by a careful selection of materials, straight-line flow of the process, and elimination of fumes. The electrolytic cells require only routine inspection to make certain that brine is flowing to each cell and remaining at the proper level. The graphite anodes are consumed gradually and the diaphragms eventually become impervious and require replacement. A cell which must be renewed is short circuited out of the line so that current to the circuit is not interrupted.

Practically no maintenance is required on the combustion chamber; the original chamber is still in service after three years of operation with but a slight degree of oxidation and no indication that it cannot continue in service for many months. The cooler-absorber units are shut down for about six hours every sixty days or so for general cleaning and the removal of silica deposits from the tube tops. No major repairs or replacements have been necessary to date. The total maintenance down-time for the entire plant averages less than 1 per cent of operating time.

* The trade-mark "Karbate" distinguishes impervious graphite products of National Carbon Co., Inc.

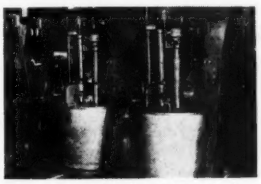
[1] Coull, Bishop, Gaylord "Hydrochloric Acid Production in a Karbate Falling Film Type Absorber." Chem. Eng. Prog. *45*, 8, 525.

A CI REPORT ON

CENTRIFUGES

Technical Improvements Bring New Uses

by JULIAN C. SMITH, Cornell University
Ithaca, New York



Fletcher Works, Inc.

STARTING WITH THE EARLY DEVICES used for dewatering clothes in laundries, new and modified centrifuges have been developed which necessitate consideration for the separation of practically any liquid-solid or liquid-liquid mixture. They have also entered an entirely new field: the classification of solids, as in the separation of starch and gluten suspensions. Another new application is in the manufacture of soap.

CENTRIFUGAL separators have been used for over a hundred years, but until about thirty years ago their use was almost entirely restricted to separating cream from milk, drying clothes in laundries, and dewatering sugar. Since 1920 they have become more and more widely used in chemical and other industrial processing. New applications are constantly being found as various problems are solved by technical improvements. In some cases, as in soap making, they have formed the basis of a completely new process; in others, as in the recovery of fish solubles from stickwater, they have played an essential part in the creation of a new industry.

Excluding bottle centrifuges and other laboratory machines, there are only four fundamentally different types of centrifuges available for industrial processing. There are several major and almost innumerable minor modifications of each type, however, to meet the requirements of specific services. The list of services to which centrifuges are adapted is not long, as shown by Table I; but such is the infinite variety of problems encountered in any one service, and the overlapping of the fields of application, that no one type of centrifuge is always best under a given set of conditions. There is always a broad area in which two or more distinctly different machines may be adapted. In addition—and this is not always fully appreciated—there are many separation problems which cannot be solved by centrifuges but require other types of separating equipment.

A number of recent articles on centrifuging and centrifugals are listed at the end of this review, some of which contain excellent descriptions of the fundamental types of machines. Previous articles, however, have given comparatively little space to a discussion of the services performed by centrifuges. The user of centrifugal machines usually has a problem before he has a centrifuge, and wants to know in advance (a) if a centrifuge would work; (b) if so, what kind he should use. Some modifications have been described only in the manufacturer's bulletins. Also the trade names are confusing; many a plant engineer has been known to say, "Who thinks up those names? What in Tophet is a Nozljector? or a ter Meer? or a Multi-Matic?"

Table II is a comprehensive list of manufacturers of centrifugal machinery for the process industries, the trade names of the machines, and the services to which the machines are adapted. Not included are the numerous manufacturers who make only cream separators, only laundry and dry-cleaning equipment, or only laboratory centrifuges, although some of the companies listed do manufacture such items as part of their line. Two of the companies[11, 16*] concentrate mainly on centrifugals for sugar refining.

The information given in Table II requires considerable elaboration, for many qualifications must be made when stating that a given centrifuge is good for this or that service. A machine may be good for dewatering crystals, for example, but the size range of the crystals, their hardness or fragility, the nature of the suspending liquor, the concentration of the slurry, the rate of production, and so forth, may all be more or less limited. There are also some important design features of the various machines that cannot be indicated conveniently in the table.

The following descriptions of available types of machines are deliberately sketchy, for detailed information can be obtained from the references listed or from the manufacturers. Following the descriptions is a discussion of the services to which centrifuges are adapted, and of the range of applicability of the various types.

TYPES OF CENTRIFUGES

Centrifugal machines can be divided into high-speed separators, large bulk centrifugals, automatic centrifugals, and continuous centrifugal "filters". The boundary lines between the divisions are not sharp, for many bulk centrifugals are partially automatic, and some continuous machines might be considered high-speed separators. However, it is safe to say that high-speed separators are used primarily for treating liquids, and that the other types handle considerable quantities of solids, and usually have dewatering of solids as their principal function.

High-speed separators may be subdivided into tubular machines, disk machines, and special devices which provide

* Numbers refer to manufacturers listed at the end of the review.

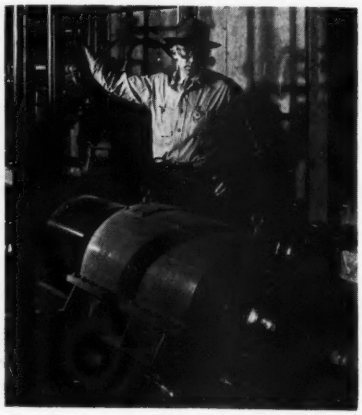
for automatic ejection of accumulated solids. Tubular machines consist of a relatively long vertical cylinder, usually not over six inches in diameter, which rotates at high speed inside a stationary casing. Feed is admitted near the bottom of the cylinder; solid particles are thrown out by centrifugal force and collect on the inner wall of the cylinder, and clear liquor escapes from the top. When separating two immiscible liquids, suitable outlets, overflow weirs, and collecting covers are provided. The bowl often contains vanes for accelerating the liquid, and sometimes contains internal cylinders or filters.

The rotor in disk-type separators is larger in diameter and not so tall as in tubular machines. A nest of perforated cones, called "disks", fills most of the interior of the bowl. Feed enters a central pipe at the top of the machine; it escapes into the bowl at the floor of the rotor, and passes upward through the disks. The disks stratify the processed liquid into thin layers, so that solid particles or globules of emulsified liquid have only a short distance to travel before being separated. As in the tubular machines, solids collect inside the rotor, and the clarified liquid or liquids escape from the top of the bowl.

In high-speed separators which automatically eject accumulated solids, the rotor is also relatively short in relation to its diameter. The solids are discharged as a more or less concentrated slurry through orifices in the periphery of the bowl at the position of maximum diameter. In the nozzle-discharge type without recirculation small tangential nozzles permit the continuous discharge of a rather dilute slurry; in nozzle machines with internal recirculation the slurry discharge may be highly concentrated; in valve-discharge machines, valves operated mechanically or by hydraulic pressure intermittently discharge moderately dry solids.

Large bulk centrifugals are used for the batchwise dewatering of crystals and fibrous materials, and to some extent for clarifying liquids. Top-suspended machines consist of a fairly large cylindrical basket, suspended and driven from above, and rotating inside a stationary casing. The wall of the basket may be perforated or solid. The feed slurry is admitted to the rotating basket until sufficient solids have been collected and the feed is shut off. With a perforate basket the solids can be washed and spun "dry", and are discharged through an opening in the bottom of the basket, usually by an unloading knife. The basket of a link-suspended machine may be driven from above or below; the basket and casing, or "curb", is suspended from three or four vertical posts by chains or rods. Thus the casing is free to move to some extent, as the basket rotates about its center of gravity. Link-suspended baskets are almost always unloaded through the top, although bottom-discharge machines are made. Solid-curb or base-bearing machines are comparatively small, and contain an under-driven basket rotating in a solidly mounted casing. They are always loaded and unloaded from the top.

Although vertical basket centrifugals are often partly automatic, in all fully automatic batch machines the basket rotates about a horizontal axis. In the perforated basket types, slurry is admitted, the crystals are washed, spun, and discharged, and the screen is rinsed, all automatically and at full basket speed. Similar cycles are used in imperforate basket machines. Although strictly speaking they are batch centrifugals, the operating cycles are usually so short—often less than 60 seconds—that these machines are well adapted to use in continuous processes.



Bird continuous centrifuge at the laboratories of the Aluminum Company of America.

Several truly continuous machines for dewatering solids are available. The most widely used is the conveyor type, in which solids are moved to the discharge point by a helical conveyor rotating slightly slower than the centrifuge bowl. In screen conveyor machines a cylindrical slotted bowl or a perforated cone bowl[7] is used. Feed from a perforated central pipe is sprayed into the interior of the bowl; the liquid escapes through the slots, leaving a cake of solids behind. In conical solid-bowl machines the liquid escapes through ports in the large end of a truncated cone, forming a pond inside the bowl out of which the solids are conveyed. In cylindrical solid-bowl machines the pond of liquid covers most of the inner surface of the bowl, so that the solids conveyed are submerged in liquid at all times until just before they are discharged.

The shove type of continuous centrifuge is used for dewatering relatively coarse crystals. Slurry feed is admitted to a rotating horizontal perforated basket. The liquor drains from the crystals; the solids are intermittently moved across the inner surface of the basket by a reciprocating piston, and discharge from the open face of the basket into a casing. The thickness of the cake and the rate of travel of the solids are adjustable.

SEPARATION OF IMMISCIBLE LIQUIDS

The problem of separating two absolutely clean immiscible liquids is rarely encountered in industrial processing. Most process liquids contain some dirt or scale or other solid contaminant, which frequently stabilizes emulsions of the liquids to be separated. Very small amounts of solids, however, can be allowed to accumulate and to be discharged at intervals by hand; when liquids contain considerable solids, manual discharge, at least of high speed separators, becomes uneconomical. This section is a discussion of the separation of liquids containing less than 0.5% solids by weight; the separation of liquids containing more solids than this is discussed in the next section. For the separation of nearly clean liquids, high-speed separators are used almost exclusively.

In the absence of stabilizing agents, the use of a centrifuge may not be justified. Often batch or continuous settling tanks are quite satisfactory, and are considerably cheaper. Even when solids are present, it usually pays to try filtering the emulsion through cloth or a mat of glass fiber to remove some of the solids. After such filtration a stubborn emulsion will often separate readily by gravity. Centrifuges have several advantages, however, to offset their higher cost: they are quick, positive, and thoroughly clean the liquids while separating them. The speed of separation is of particular value when a chemical reaction must be stopped by separating the reactants.

For separating non-volatile liquids the simple tubular high-speed separator is very satisfactory. The Supercentrifuge[14] contains a bowl 4 inches in diameter rotating at 15,000 r.p.m., which generates a centrifugal force 13,500 times the force of gravity. This is the highest force generated by any full-scale machine. The National Acme centrifuge[13] and the Condenser Service Lab model[7] are about 6 inches in diameter, and rotate at a considerably lower speed. The flow of liquids through these machines is continuous, but at intervals the bowl must be stopped and removed and the accumulated solids scraped out. Between 5 and 30 pounds of wet solids can be collected before the clarity of the discharged liquids is affected. The parts of the bowls are all simple and easy to clean, so that they can be taken apart and reassembled in about 15 minutes; if a spare bowl is provided, the machine can be stopped, the bowl removed and replaced, and the flow started

TABLE I—SERVICES PERFORMED BY CENTRIFUGES

A. Separation of clean liquids.
B. Liquid-liquid separation with removal of solids.
C. Clarification of liquids.
D. Thickening of slurries.
E. Dewatering of crystals.
F. Dewatering of textiles and fibers.
G. Dewatering of sludges.
H. Classification of solids.
I. Special services: Impregnation, enamelling, galvanizing, painting, chip wringing, chemical reactions, washing, rinsing and drying of metal parts.

TABLE II—TYPES AND MANUFACTURERS OF CENTRIFUGES

Type	*Modification*	*Trade Name*	*Manufacturer*	*Service**
High-speed Separators	Tubular	.....	National Acme	A, C, b, h
		Supercentrifuge	Sharples	A, C, b, h
	Empty Bowl	Multiple Clarifier	DeLaval	C, h
	Disk	.....	Columbia Westfalia	A, C, b
		Industrial Separator	DeLaval	A, C, b
		D-2	Sharples	A, C, b
	Nozzle discharge	Nozzle-Matic	DeLaval	B, C, D, H
		.....	Merco	B, C, D, G, H,i
		Nozjector	Sharples	B, C, D, H
	Valve discharge	Nozzle-Matic AC-MO	DeLaval	B, C, D
		Multi-Matic	DeLaval	C, D
		Autojector	Sharples	B, C, D
Bulk Centrifugals	Perforated basket: Top Suspended	.....	A. T. and M.	E
		.....	Bird	E
		.....	Fletcher	E
		.....	Hepworth	E
		.....	Tolhurst	E
		.....	Western States	E
	Perforated Basket: Link suspended	.....	A. T. and M.	E, F, I
		Whirlwind	Fletcher	E, F
		Hercules Automatic	Haring and Stephens	E, F
		.....	Tolhurst	E, F
	Perforated Basket: Solid curb	.....	A. T. and M.	F, e, i
		Various	Barrett	F, I
		Standard; Junior	Fletcher	F, e
		Hercules Type C	Haring and Stephens	F, e
		.....	Tolhurst	F, e
	Imperforate Basket: Top suspended	.....	A. T. and M.	C, G, d, h
		.....	Bird	C, G, d, h
		.....	Fletcher	C, G, d, h
		.....	Tolhurst	C, G, d, h
	Imperforate Basket: Link suspended	.....	A. T. and M.	C, G, I, d
		.....	Fletcher	C, G, I, d
		.....	Tolhurst	C, G, d
	Imperforate Basket: Solid curb	.....	A. T. and M.	C, I, d, g
		.....	Barrett	I
		.....	Fletcher	C, I, d, g
		.....	Tolhurst	C, d, g
Automatic	Perforated Basket	ter Meer Automatic	Baker Perkins	E
		Super-D-Hydrator	Sharples	E
	Imperforate Basket	ter Meer Automatic Clarifier	Baker Perkins	C, d, g
Continuous	Conveyor: Screen type	.....	Bird	E
		CME	Condenser Ser. and Eng.	E
			Cent. and Mech. Ind.	E, I
	Conveyor: Solid bowl conical	.....	Bird	E, G, H, d
		CME	Condenser Serv. and Eng.	E, G, H, d
		Super-D-Canter	Sharples	E, G, H, d
	Conveyor: Solid bowl cylindrical	.....	Bird	G, D, h
		CME Demulsifier	Condenser Serv. and Eng.	B, c, d
		Cyl. Super-D-Canter	Sharples	G, d, h
	Conveyor: Combination screen and solid bowl Shove type	CMI Dryer Clarifier	Cent. and Mech. Ind.	C and E
		ter Meer Continuous	Baker Perkins	E

* Letters correspond to services listed in Table I. Upper-case letters indicate principal uses; lower-case occasional use.

again in less than 5 minutes. An especially designed volute for discharge of solids eliminates the necessity for shutdown in a Condenser Service machine.[7]

Corrosive liquids can be handled by making the bowl and covers of suitable material. Stainless steel, Monel, bronze, and other materials of sufficient strength and machinability are used. Closed-discharge machines[13, 14] are available for processing corrosive and dangerous materials. The "No-Foam" Supercentrifuge[14] delivers clarified liquid under pressures up to 25 lb./sq. in. with almost no contact with air. The Presurtite Supercentrifuge[14] may be operated under moderate pressure or vacuum and is well-suited to separating volatile liquids. Because the time of passage through the centrifuge is so short, hot liquids cool only slightly as they go through the machine; where even a small drop in temperature cannot be tolerated, a steam-jacketed casing[14] is used. Tars and similar viscous materials require extra-large discharge spouts,[13, 14] which may be easily opened for cleaning; when one of the liquids is too viscous to flow easily, as in continuous soap-making, it may be flushed from the discharge cover by jets of other process liquid.[14]

Liquid inside a rotating tube tends to slip, and is not subjected to the full centrifugal force. To minimize slippage a simple impeller having three or four vanes is often inserted in the bowl. To shorten the distance particles of dirt and globules of liquid have to travel in order to be separated, internal cylinders may be used so that the liquid makes three passes through the bowl.[13] In many cases this improves the separation considerably but reduces space for sludge collection.

Disk centrifuges[6, 8, 14] are also widely used for separating immiscible liquids. The disks divide the liquid into thin layers, usually not more than 0.05 inch thick. The bowl is 12 to 20 inches in diameter, and rotates at 3,000 to 6,500 r.p.m.; the centrifugal force is about 7,000 times gravity.

This type of machine is more effective in separating certain emulsions than is the tubular type, even though it generates a lower centrifugal force. The separation of cream from milk is an example; cream separators are all disk machines. Disk machines are generally more complicated and expensive than the tubular machines, however, and take longer to clean. They will hold considerably more dirt than tubular machines, but the choice between a tubular and a disk machine is the product of weighing the advantages of a short operating cycle with easy cleaning (tubular) and a longer operating cycle with more difficult cleanings (disk). They are made in a variety of corrosion-resistant materials but are more easily adapted to the processing of low-viscosity liquids. Close-discharge disk machines are also available.[6, 8, 14]

REPRINTS

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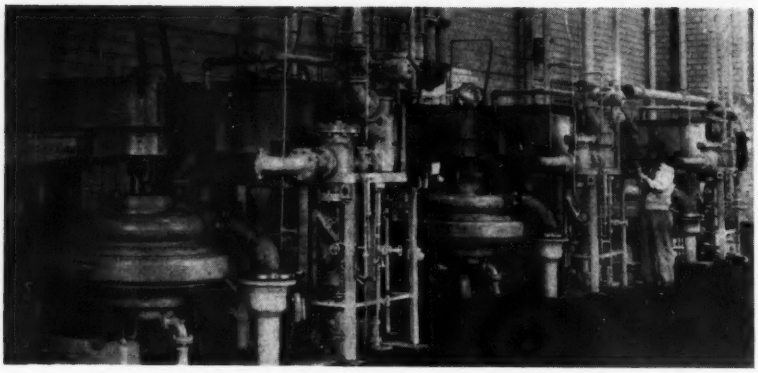
With a given separator, the rate of throughput depends on the degree of separation desired, the difficulty of separation, the nature of the liquids, and to some extent the relative quantities of the two fluids. It is impossible to give exact capacities of the various machines. Broadly speaking, the Supercentrifuge will handle from 0.5 to 30 gallons per minute; the Condenser Service machine up to 35 gallons per minute; the National Acme machine up to 50 gallons per minute; and disk machines up to 100 gallons per minute or more. Liquids differing in density by 3% can be separated effectively in these machines, and with special construction and low throughput rates separation may be good when the difference in densities is as little as 0.5%.

In most cases the effluent liquids have a definite specific gravity, and overflow weirs are used to insure that some of each liquid is always present in the bowl. The weirs are adjustable so that the position of the interface between the liquids may be varied. When the problem is one of concentration rather than complete sepa-



Merco B-30 centrifuges separate starch from gluten for the Union Starch & Refining Co.

ration, as in making cream or in concentrating rubber latex, special overflow parts are used. In problems such as the removal of traces of water from oil, in which there may be none of one liquid in the feed for considerable periods of time, still other overflow devices are employed.[8, 13, 14] By a simple change many high-speed separators may be adapted from the separation of two liquids to the clarification of a single liquid. This service is discussed in a later section.

LIQUID-LIQUID SEPARATION WITH REMOVAL OF SOLIDS

As mentioned before, almost all problems of liquid-liquid separation involve the simultaneous removal of some solids. When more than about 0.5% solids are present, however, intermittent manual discharge becomes uneconomical. Several machines are on the market which automatically discharge solids as a more or less concentrated slurry and separate two liquids at the same time. The type of solids that can be discharged from these machines is unfortunately rather limited; many problems involving liquid-liquid-solid separation must be solved by using a series of separating devices.

The most widely used centrifuges which continuously discharge solids are high-speed separators provided with nozzles in the periphery of the bowl. The Nozzle-Matic[8] and the Nozljector[14] are disk centrifuges of this type. The nozzles discharge a fluid slurry tangentially away from the direction of rotation of the bowl; the two clarified liquids are discharged over weirs at the top of the bowl, as in the usual separators. The nozzle openings are necessarily quite small, so that these machines can be used only with liquids carrying fine non-abrasive particles. Enlargement of the openings by wear or corrosion decreases the effectiveness of separation and increases the power required. Since considerable liquid is discharged even through very small openings, the minimum feed rate to the smallest of these machines is about 7 gallons per minute; at lower feed rates all the feed liquid would escape through the nozzles. The maximum throughput rate for single machines of this type is about 100 gallons per minute. Such machines are used in separating citrus oil from water containing small particles of orange peel; for separating fish oil from press liquor, with continuous removal of solids; and similar services.

The Merco centrifuge[12] is a nozzle-discharge disk machine with a very wide range of application. A massive rotor 11 to 40 inches in maximum diameter rotates in a special casing at speeds between 2,700 and 9,000 r.p.m. Throughput rates range from 10 to 350 gallons per minute. In recent years this machine has found wide use in solving difficult separation problems, particularly in the separation of starch from gluten. Its advantages over earlier nozzle-discharge centrifuges arise from the recirculation feature, in which part of the underflow is returned to a special "racing chamber" in the bowl, where additional heavy material is picked up and discharged from the nozzles. Automatic controls regulate to any desired value the fraction of the heavy discharge that is recirculated. This recirculation permits the discharge of very concentrated, viscous slurries, containing as much as 80% solids; it eliminates the need for very small nozzle openings and greatly decreases the effect of abrasion and corrosion on the performance of the machine. Good washing by displacement is possible if several machines are used in series. One model discharges a slurry and two clarified liquids; other models are used for concentrating and classifying solids. A nozzle discharge centrifuge with internal recirculation, and a valve-discharge machine with automatic mechanical control of the valves on a timed cycle, are now supplied by the Sharples Corporation.

Nozzle-discharge machines necessarily eject a fluid mixture of solids and heavy liquid and require that a considerable amount of heavy liquid be present if all the light liquid is to be separated from the solids. Valve-discharge separators dewater the solids more effectively and are not so restricted as to rates and proportions of the feed liquids. The Nozzle-Matic Model AC-MO[8] and the Autojector[14] contain hydraulically balanced valves built into orifices in the shell of the bowl. Most of the time the hollow valve stem is filled with liquid, a little of which continuously escapes through the orifices; when sufficient solids accumulate they block the entrance port to the valve stem, and the liquid drains out. The empty stem then "floats" on the liquid in the bowl, opening the valve and allowing the solids to be ejected. Because of lag in the valve the cake of solids is far from dry. The type of solids that can be discharged from such machines is more limited than that handled by nozzle-discharge centrifuges; they are most widely used in recovering wool grease from scouring liquor, while simultaneously removing dirt and other foreign material from the soapy water. The range of throughput rates is the same as that of nozzle-discharge separators. The Multi-Matic[8] is a valve-discharge separator, but is adaptable to liquid-liquid separations. It is discussed in a later section.

The CSE Demulsifier[7] is a vertical solid-bowl conveyor centrifuge which clarifies the light liquid and continuously discharges the solids with the heavy liquid. Subsequent clarification of the heavy liquid can be done in a second centrifuge or filter. This machine generates a much lower centrifugal force than do the high-speed separators discussed previously, and it is restricted to solids that settle readily and that can be conveyed by the helix. Models are available which handle from 3 to 30 gallons per minute of feed.

Sometimes, of course, the solids float on the light liquid, or at the interface between the two liquids. In such cases none of the foregoing machines will make a complete separation. Solids which float on the light liquid can be skimmed off through a decanting line, or may overflow with the light liquid and be separated from it in a second machine. If the solids sink in the light liquid and float on the heavy one, the usual practice is to set the position of the interface between the two liquids close to the point of discharge of the heavy liquid. The solids then pass out with the heavy liquid, as in the separation of wax from cylinder stock. However, it is usually best to filter the solids from the mixture of liquids in a filter or a basket centrifugal and then separate the two liquids by gravity or in a high-speed centrifugal separator.

CLARIFICATION OF LIQUIDS

As in the discussion of other services, it is necessary to be somewhat arbitrary in distinguishing clarification of liquids from thickening of slurries and dewatering of solids. The class in which a given problem falls often depends on whether the solid or the liquid is the desired product. Clarification of liquids implies that

comparatively small amounts of solids are being removed from a liquid and that usually, though not always, the clarified liquid is the desired product. Examples are the "polishing" of fruit juices, lacquers, varnishes, and so forth, to give products that are sparkling clear.

High-speed tubular centrifuges[8, 13, 14] are extensively used for such clarification, particularly where the solids are gelatinous and non-filterable. The bowl is provided with a single liquid discharge; the collected solids must be discharged manually as in problems involving liquid-liquid separation. Exceedingly fine light solids sometimes are not thrown down completely, even by the tremendous centrifugal force.

An internal cylinder is used in the DeLaval Multiple Clarifier[8] to lengthen the path of travel through the bowl, which is short and pear-shaped as in the disk-type separators. No disks are used, however; the bowl is empty except for the internal cylinder and accelerating vanes. Three-pass tubular centrifuges with internal cylinders are also available.[13]

Sometimes for complete clarification a filter cylinder inside the bowl of a tubular centrifuge is used.[13] Solid particles which are not thrown down collect on the outside of the porous cylinder; once deposited they usually agglomerate and are thrown off the filter by centrifugal force to the inner wall of the bowl. The filter is thus self-cleaning to a considerable degree. In general, however, external filter surface is much cheaper.

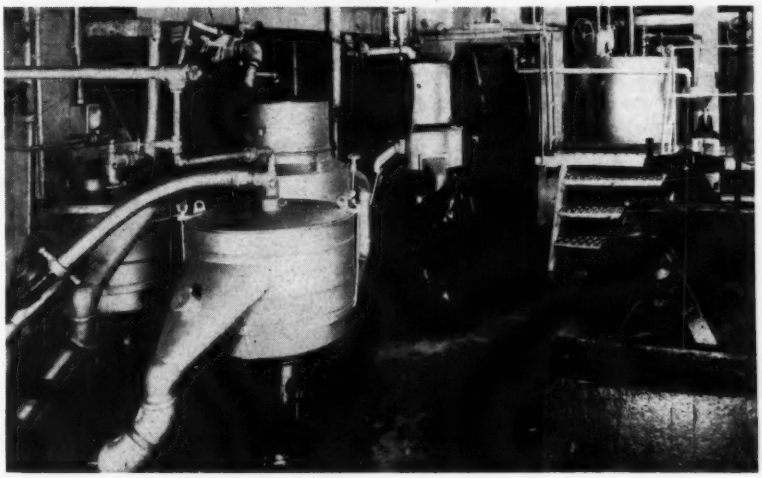
Some materials, notably aluminum and ferric hydroxides, cannot be removed in a high-speed centrifuge, even though they flocculate and settle fairly rapidly by gravity. In feeding slurries of these solids to the rotating bowl the flocs break up, and clarification is poor. The filter cylinder is of no help, for it is quickly plugged by such solids. This kind of solid can sometimes be removed in the ter Meer Automatic Clarifier[2] described later.

Disk centrifuges[6, 8, 14] are used for clarification when very small amounts of solids are present. Nozzle-discharge[8, 14] and valve-discharge separators[8, 14] are used where the proportion of solids is fairly high, where considerable liquid can be allowed to escape with the solids, and where the solids will discharge satisfactorily through the nozzles or valves. The Multi-Matic[8] is a high-speed clarifier in which the bowl is divided into six compartments. Liquid is fed into the top of a hollow spindle and is distributed to the several sections of the bowl. The concentrated solids are discharged through valves in the tip of each compartment which are mechanically operated at controlled intervals. Clarified liquid is discharged from a collecting chamber at the base of the machine. The Multi-Matic discharges a concentrated slurry of sticky solids that cannot be handled in nozzle-discharge machines without recirculation, as in the concentration of proteins in the treatment of soya bean meal and the concentration of distillery slop.

A good method of clarifying large quantities of liquids when the solids settle fairly easily is to use an imperforate basket bulk centrifugal.[1, 4, 9, 15] In such machines the liquid fills the bowl and overflows the top lip; solids accumulate in the basket and must be discharged at intervals. Since three or four hundred pounds of wet solids can be collected before dumping the basket, however, the intervals between discharging can be many hours long. The feed rate depends on the density and particle size of the solids; throughput rates between 10 and 100 gallons per minute are common. Since these machines generate only 1,800 times the force of gravity, compared with as much as 13,000 times gravity in high-speed separators, they will not throw down particles easily removed by the high-speed machines, and the effluent liquid is rarely absolutely clean. New CSE designs[7] permit intermittent filling of the bowl with liquid, spinning it until sedimentation is complete, and then decanting the supernatant liquid. This makes clarification much more effective. However, it involves so much attention with most machines that it usually is done only with fully automatic clarifiers.

The ter Meer Automatic Clarifier[2] contains a horizontal imperforate basket 18 to 96 inches in diameter. In the overflow system the liquid escapes over a lip at the face of the basket; at suitable intervals the feed is shut off, a skimmer removes any liquid remaining in the bowl, and the cake of solids is peeled off by a knife unloader. In the skimmer system the drum is filled with slurry through a charging nozzle designed to assure minimum disturbance of the liquid; the solids are thrown out of the liquid; the supernatant liquid is skimmed off; and the cake of solids is unloaded. The settling period is short, usually only one or two minutes. With dilute slurries the drum is filled and skimmed several times before the cake is removed. All of the operations in both systems are fully automatic, and the time intervals may be adjusted within wide limits. The capacity of the centrifugals is large; from 2 to 300 gallons per minute of liquid may be clarified in a single machine.

The CMI Dryer-Clarifier[5] is a combination conveyor-type continuous centrifuge which simultaneously dewaters large quantities of coarse solids in a slotted bowl and removes small quantities of fine solids from the liquor in a solid bowl. The CSE machine[7] utilizes a perforated conical bowl. The clarified liquor usually contains less than 1% solids and may be reused for washing or other purposes.



To refine fish oil DeLaval suspended centrifuges extract press liquor from meal (right), separate oil from press liquor in Model AC-Vo Nozzle-Matics (center) and purify oil (left).

THICKENING OF SLURRIES

Very often it is desirable to thicken a dilute slurry so that it may be returned to process, or to lighten the load on subsequent dewatering equipment. In processing stillage, for example, the volume of material is reduced many times by such thickening. The only real difference from liquid clarification, however, is that the solids are usually the desired product, and the liquid is often sent to the ditch.

Thus many of the machines used for liquid clarification are used for thickening slurries. Nozzle-discharge and valve-discharge separators[8, 14] are widely used as are imperforate basket centrifugals[1, 4, 9, 15]. The ter Meer Automatic Clarifier[2] finds some application in this service.

A few separators are especially designed for concentrating certain slurries. The DeLaval Latex Concentrator[8] differs

from other DeLaval separators in that the bowl consists of two cones, one inverted, with their bases in contact. Nozzles are set at the point where the diameter is a maximum. This machine concentrates latex to more than 60% rubber solids, which is removed from the center of the bowl. Other special nozzle-discharge machines are used for concentrating yeast [8, 14]. One type of Merco centrifuge[12] is used for concentrating weighting materials in oil-well drilling mud.

Solid-bowl conveyor centrifuges [4, 7, 14] are used to a small extent for slurry thickening. By adjusting the overflow ports so that the pond of liquid covers the entire inner surface of the bowl, some control can be maintained over the concentration of the discharged solids. With some fine sludges, even under the best dewatering conditions, these machines discharge solids in a form that is on the borderline between a sloppy cake and a heavy slurry. The CSE Demulsifier[7] may be used for slurry thickening; clear liquor is decanted through the line used for removing light liquid in problems of liquid-liquid separation.

American Machine and Metals Co. produces Tolhurst variable speed suspended centrifuge

DEWATERING OF CRYSTALS

Free-draining crystalline materials can be dewatered more throughly and often more economically by centrifuges than by any other type of filter. The variety of solids handled is enormous; tonnages range from a few pounds to many tons per hour; particle sizes vary from coarse to exceedingly fine. Materials smaller than 300 mesh or so, however, are not free draining and require the machines discussed under "Dewatering of Sludges." Some automatic and continuous centrifuges do not work well unless the solids are considerably coarser than this.

Perforate-basket bulk centrifugals are admirably suited to dewatering relatively fine crystals, or coarse crystals when the tonnage is not sufficient to justify the cost of continuous equipment. Sugar, of course, is an exception, for although it would seem that continuous centrifuges should work, and much effort has been spent in their development, batch centrifugals are still exclusively used except in one refinery. Suspended-basket machines are most used for crystal dewatering; link-suspended machines to a much smaller extent; and solid curb machines almost not at all.

Commercial suspended-basket centrifugals range in diameter from 12 to 48 inches and hold up to 12.5 cubic feet (400 to 800 lb.) of wet solids. The larger machines generate about 800 times the force of gravity; special 40-inch machines generate up to 2,700 times gravity. A coarse screen is fitted inside the perforated basket to support the filter medium, which may be fine metal screen, cloth, or even paper. The basket and casing may be made of steel or any corrosion-resistant metal of sufficient strength. Often strengthening rings on the basket's outer wall are used.

The frequent starting and stopping of the basket requires that the drive be rugged, and that a good clutch or coupling and good lubrication be provided. Most machines in use today are driven by individual electric motors, although gear-driven[11, 16] and belt-driven[1, 9, 11, 16] centrifugals are used where batteries of machines are needed as in sugar processing. High-speed 40-inch machines[1, 9, 11, 16] for some grades of sugar are equipped with steam-turbine drives, or water-turbine drives. For pilot-plant work a 20-inch or 26-inch centrifugal with a variable-speed hydraulic drive is available[9, 15]. Single speed motors are common, but often two-speed motors are used so that the basket can be loaded while rotating at moderate speed and spun at a much higher speed. Variable-speed DC[1, 9, 16] and AC[9, 16] motors are also available.

Unloading is done with the basket stopped or rotating at about 50 r.p.m. To get the low speed the operator may jog the motor while unloading; more satisfactory, however, are the Centroid control[9] and the Two-Motor Freewheeling Drive[1], both of which assure a positive, constant unloading speed. The knife unloader is usually manually operated but may be driven hydraulically or pneumatically[4, 9, 11]. Most centrifugal baskets are flat-bottomed; with a few materials, however, the Lewis open-bottom basket[1, 9, 11, 16] may be used. The slurry of free-flowing solids is fed onto a rotating circular plate which flings it into the basket; when the basket is stopped the solids drop out through the conical bottom without help from an unloader.

Wash liquid is sprayed onto and through the cake of solids by suitable nozzles. Effluent wash normally leaves the casing through the same tangential outlet as the mother liquor and may be kept separate from the liquor by adjusting suitable valves in the outlet line. When more complete separation of the effluents is necessary, multiple outlets in the casing[1, 9, 11, 16] are provided. To minimize contamination of very viscous liquor with effluent wash, a sloping skirt surrounding the basket[2] may be used, which, with suitable diverters, directs the liquid spun from the basket exactly to the proper discharge point. When processing volatile and toxic materials, casings fitted with fume hoods [4, 9] are employed.

Link-suspended or center-slung centrifugals are much less used for dewatering crystals than are top-suspended machines, because they are less easily adapted to discharging from the bottom. In most makes the basket contents are shoveled out through the top, although bottom-discharge machines are made[1, 9]. Link-suspended machines have the advantages that they require little head-room and can readily be made fume tight. Their most extensive use for crystal dewatering is in pharmaceutical houses, since they can be made absolutely clean between successive batches of materials.

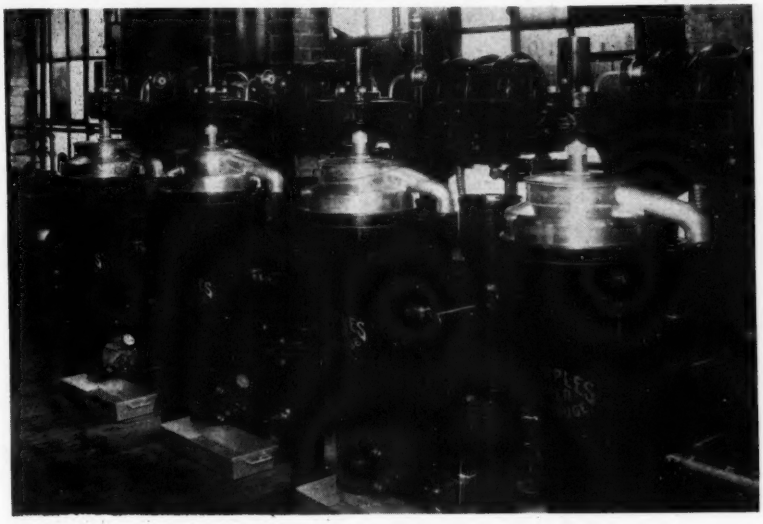
The productivity of basket centrifugals varies widely, depending on the nature of the crystals and the amount of washing required. With sugar the usual operating cycle is 2½ minutes; with most chemicals it varies between 10 and 30 minutes. Thus for most chemicals a 48-inch centrifugal may be expected to process 800 to 5,000 lbs. per hour. The moisture content of the solids is ordinarily between 4% and 35% on a wet basis.

To some extent the operating cycle of suspended centrifugals may be automatically controlled. In sugar refining, for example, loading and unloading are almost always done manually; acceleration, washing, spinning, and braking are all automatic[1, 9, 11, 16]. One sugar refinery has made the operation fully automatic. Automatic controls for link-suspended centrifugals can also be obtained[1, 9, 10]. The use of fully automatic machines, however, is restricted to fairly coarse crystals, 100 to 150 mesh minimum, and production rates of at least 200 or 300 pounds per hour of dry solids. Very fine crystals will not discharge properly from these devices, and with low production rates the high first cost cannot be justified economically.

The Super-D-Hydrator[14] is made in two sizes: 20-inch and 27-inch. The filter medium is usually a 100-mesh metal screen, although finer screens can be used if necessary. All operations, including loading and unloading, are performed with the basket rotating at full speed; the overhung horizontal basket is supported by rugged fixed bearings which can stand

the rough treatment. The ter Meer Automatic Centrifugal[2] is similar in construction; it is made in sizes from 18 inches to 96 inches, with basket capacities between 1 and 120 cubic feet. In the larger sizes two drums back to back in a single casing have been used, and for slow-draining materials the wall and the hub of the basket are both perforated.

It is a common misconception that fully automatic machines can handle anything that can be dewatered in an ordinary centrifugal. Solids which contain more than 15% or 20% water after centrifuging rarely discharge properly from automatic machines, and slow-draining crystals which require the use of cloth or paper as filter media result in such long operating cycles that the expensive automatic features are not justified. In addition, these machines do not give as clear an effluent as carefully operated batch centrifugals; the liquor ordinarily carries about 0.5% solids. Automatic machines have found their greatest use in dewatering fairly coarse crystals, such as ammonium sulfate, where operating cycles of 40 to 60 seconds permit even a 20-inch machine to dewater more than a ton an hour of solids.



Continuous refining of vegetable oils with the Sharples Super-Centrifuge

Screen conveyor centrifuges are used with even coarser crystals, when not more than 10% is smaller than 100 mesh. Actually no screen is used; the liquid drains through slots in the bowl wall, and the retained solids are conveyed to the discharge openings. Horizontal machines[4, 7] are made in sizes between 24 inches and 54 inches in diameter and handle between 0.5 and 50 tons or so per hour. The cake may be washed thoroughly and the wash kept separate from the mother liquor. The CMI Dryer[5] contains a vertical conical slotted bowl. Feed enters the upper small end; the liquid escapes into the casing, and the solids are conveyed to the lower large end, from which they discharge. It is made in 26- and 48-inch sizes and will dewater 2 to 75 tons per hour. Like other slotted-bowl centrifuges it can handle coarse solids only and does not give a completely clear effluent. As mentioned before, the CMI Dryer-Clarifier[5] is a combination slotted-bowl and solid-bowl machine and gives a cleaner effluent than the standard machine.

Solid-bowl conveyor centrifuges[4, 7, 14] can do almost anything that can be done in a slotted-bowl machine and are considerably cheaper. They can handle finer solids, even mixtures of coarse and fine solids; they give clearer effluents; they can wash the crystals as effectively, or almost as effectively, as the screen machines. They are made in smaller sizes, down to 7 inches in diameter,[7] which generate a much higher force than do the larger units. Their disadvantages are that washing is not always as good as in slotted-bowl machines, and the wash and mother liquor cannot be removed separately.

The ter Meer Continuous Centrifuge[2] is a shove-type machine designed for dewatering coarse crystals. It is made in sizes between 12 inches and 48 inches, which handle from 0.3 to 24 tons per hour. A rotating funnel brings the slurry up to speed before it strikes the rotating basket, and there is no knife to break the crystals while unloading them. Thus there is less crystal degradation than in fully automatic centrifugals; there is some crystal breakage, however, when the solids fly off the basket and strike the wall of the casing.

DEWATERING OF TEXTILES AND FIBERS

Textiles and fibrous materials are dewatered in link-suspended or solid curb centrifugals fitted with perforated baskets. Bolts of cloth are placed in the stationary basket by hand and are spun to 30 to 50% moisture content. The basket is stopped once more and the contents removed through the top. Machines with easily removable baskets are available.[9]

"Dewatering" includes the removal of volatile dry-cleaning fluids; for this service fume-tight covers are available from almost all manufacturers of link-suspended machines. These are usually larger than top-suspended centrifugals, ranging in size from 12 inches to 100 inches, and operate at lower speeds. The usual operating cycle is 10 to 20 minutes, much of which may be automatically controlled.[1, 9, 10] No fully automatic machines are available, however.

DEWATERING OF SLUDGES

Solids too fine to drain freely in a perforated basket centrifugal may be dewatered in solid bowl machines. As discussed under clarification of liquids, the liquor may be overflowed from the top lip of an imperforate basket suspended centrifugal and the solids discharged at intervals. Even when the residual liquid is skimmed off the surface of the cake, however, the solids retain considerably more moisture than do those discharged from perforated baskets. Some washing can be done by filling the basket with wash water and decanting it several times, but repulping the discharged cake and recycling it through the centrifugal is much more effective.

For continuous operation solid-bowl conveyor centrifuges are used. The Super-D-Canter[14] is a 14-inch machine which generates a high centrifugal force, approaching that generated by high-speed separators. It is designed for difficult separations and fairly low production rates. Other makes of solid-bowl machines[4, 7] range in size from 7 inches to 54 inches, and handle up to 60 tons an hour. Spray washing in the machine is usually not very effective when heavy fine solids are being dewatered; where good washing is needed it is customary to use two or more machines in series and to repulp the cake in wash water between stages. The degree of dewatering depends on the particle size and density of the solids; commonly the dewatered sludge contains 60 to 70% solids.

Fine light solids usually cannot be dewatered in conveyor centrifuges, since they are resuspended too easily in the liquor by the helix. A number of materials can be conveyed when submerged in the liquid, but not out of it; for such solids the cylindrical solid-bowl centrifuge has been designed. In the Bird cylindrical machine[4] the solids are conveyed out of the liquid up a very short incline just

before the discharge point. In the cylindrical Super-D-Canter[14] the solids are never lifted out of the liquid; they build up at one end of the bowl and are extruded by a special conveyor through ports in the end plate of the cylinder, instead of through the bowl wall as in other machines. This machine is restricted to handling solids that can be so extruded, and washing can only be done by repulping. Sludges discharged from cylindrical centrifuges contain less water than do those from conical machines because of the larger diameter at the discharge point.

CLASSIFICATION OF SOLIDS

Centrifugal classifiers are being more and more widely used in place of other types because they are quick, require little space, hold up little material, and accurately classify even very fine particles in the micron range. They are used for such services as degritting of pigments, separating starch from gluten, and in closed-circuit wet grinding of minerals.

High-speed tubular centrifuges[13, 14] have been used for many years for removing grit and oversize particles from pigments and dyes. The amount of solids collected is small; the exceedingly fine dye particles are not thrown down even under 13,000 times gravity. Some dispersion of the material is done simultaneously; to increase the dispersing action an enamel spider[13] may be used inside the bowl. Solid-bowl conveyor centrifuges are beginning to find use in such degritting problems, even though the amount of solids discharged is less than 50 lbs. per hour.

Various models of the Merco centrifuge[12] are especially designed for certain classifications, in particular the separation of starch from gluten. Starch tables have been made obsolete by this machine. It is also used for desanding rotary drilling mud, removal of grit from pineapple juice, etc. Other nozzle-discharge machines[8, 14] are used for classifying nonabrasive materials. Imperforate basket suspended centrifugals[1, 4, 9, 15] are used to some extent for classification.

The centrifugal classifier[4, 7] is a modified conical solid-bowl conveyor centrifuge. By correctly balancing the feed rate and the bowl speed, undesired large particles can be thrown down and conveyed to the discharge point while the fines overflow with considerable liquor from the usual liquor discharge ports. Precise classification of solids 10 to 20 microns in size is easily done, with production rates up to 80 tons of solids per hour. The Super-D-Canter[14] is used for even more difficult classification problems, with throughput rates of one or two tons per hour of solids.

SPECIAL SERVICES

Centrifugals are used for a number of special services. Machines for sugar processing[1, 11, 16] have several special features, and are automatically controlled to a greater extent than are other suspended centrifugals. A special enclosed link-suspended centrifugal with bottom discharge[1] has been used for reacting solids with a chemical under pressure, spinning off liquid from the reacted solids, and flashing off residual chemical under vacuum.

Operations such as enamelling, galvanizing, impregnation, and painting of small parts are done centrifugally, usually in solid-curb machines[2, 3] which are rarely larger than 30 inches in diameter. Special solid-curb machines with a conical imperforate bowl[1, 3, 9] are used for removing cutting oil from metal chips. The CMI Dryer[5] is used for wringing chips continuously.

LIMITATIONS

Centrifugal separators have many advantages over other types of separating devices. Their low holdup, large capacity for small floor space, and the dryness of discharged solids make them indispensable in many processes. They concentrate and dewater gelatinous solids and fine sludges better than any other type of equipment.

On the other hand, they have several limitations that are not always well recognized. Centrifuges that depend on not work on solids that are lighter than settling of solid particles in a liquid can the liquid; conveyor centrifuges do not work well except on very dense solids when the particles are very fine. The breakage of fragile crystals is a drawback of perforate-basket centrifugals. Washing of crystals is usually better than in other dewatering equipment, but sludges are hard to wash effectively. Although continuous machines are available to dewater fine light solids, continuous washing is impossible.

In one example, a manufacturer wished to dewater and wash about 1,000 lbs. per hour of a coarse crystalline solid. The crystals were very fragile, however, and it was essential to preserve their form throughout the dewatering. Tests showed that automatic and continuous centrifugals would dewater the material to 7% moisture, but that in all machines the crystal breakage was severe. A top-feed rotary vacuum filter proved to be the solution to the problem.

In another case, a ton an hour of a heavy metal oxide was to be dewatered and washed. The particles were very fine —about 1 micron on the average—and again no continuous or automatic centrifugal was feasible. Even the Super-D-Canter,[14] which generates the highest force of any continuous centrifuge, gave a very cloudy effluent and a sloppy cake. Centrifuges rarely give a completely clear effluent; when it is needed, a filter in series with the centrifuge is usually required.

Other limitations sometimes prevent the use of centrifuges, even when separation is good. An example is the application of continuous centrifuges to large-scale sewage disposal plants; except in small communities, the volume of very dilute slurry is so enormous that the power required to spin it at a high speed is prohibitively expensive. As with other types of equipment, it is impossible to say that centrifuging is feasible or economical in a given case without making a detailed study. The manufacturers are more than willing to cooperate in making such studies, and should be consulted before the selection of the dewatering equipment is made. The wealth of experience they have accumulated can help avoid installing machines not suited to the desired service, and is invaluable in getting the most benefit from centrifugal equipment.

ACKNOWLEDGEMENT

The author is indebted to the following manufacturers of centrifugal equipment for various portions of the information in this article:

1. American Tool and Machine Co., 1415 Hyde Park Ave., Boston, Mass.
2. Baker Perkins, Inc., Chemical Machinery Division, Saginaw, Mich.
3. Leon J. Barrett Co., 1498 Grafton Ave., Worcester 1, Mass.
4. Bird Machine Co., South Walpole, Mass.
5. Centrifugal and Mechanical Industries, Inc., 146 President St., St. Louis 18, Mo.
6. Columbia Westfalia Centrifuge, Inc., Canton 5, Ohio.
7. Condenser Service and Engineering Co., Inc., 95 River St., Hoboken, N. J.
8. DeLaval Separator Co., 165 Broadway, New York 6, N. Y.
9. Fletcher Works, Inc., Glenwood Ave. and Second St., Philadelphia 40, Pa.
10. Haring and Stephens Co., McBride Ave. at W. 35th St., West Paterson, N. J.
11. Hepworth Machine Co., Inc., 42-11 Ninth St., Long Island City 1, N. Y.
12. Merco Centrifugal Co., 1045 Sansome St., San Francisco 11, Calif.
13. National Acme Co., 170 East 131st St., Cleveland 8, Ohio.
14. Sharples Corp., 23rd and Westmoreland Sts., Philadelphia 40, Pa.
15. Tolhurst Centrifugals Division, American Machine and Metals, Inc., East Moline, Ill.
16. Western States Machine Co., 350 Madison Ave., New York, N. Y.

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DESCRIPTION

Chemical formula: H_3PO_4

Specific gravity: 1.692 (20°C/4°C)

Freezing point: 21°C (70°F)

Viscosity relative to water at 25°C (77°F): 43.5

Turbidity: none

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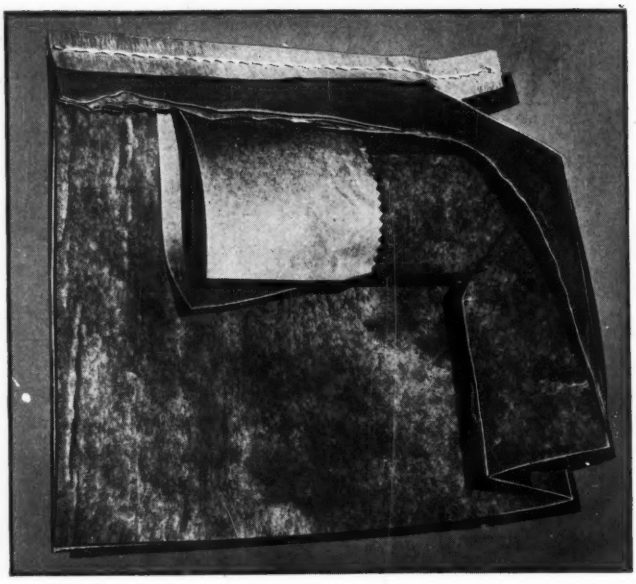

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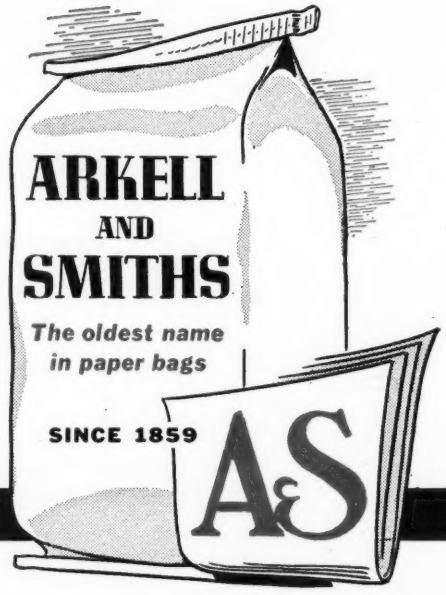

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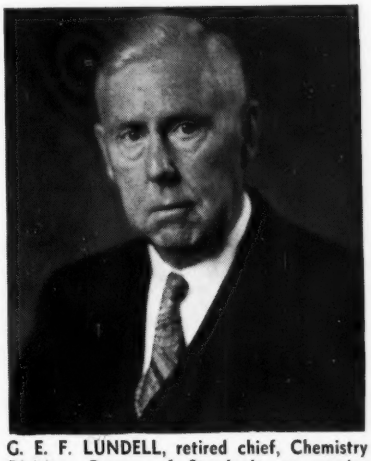


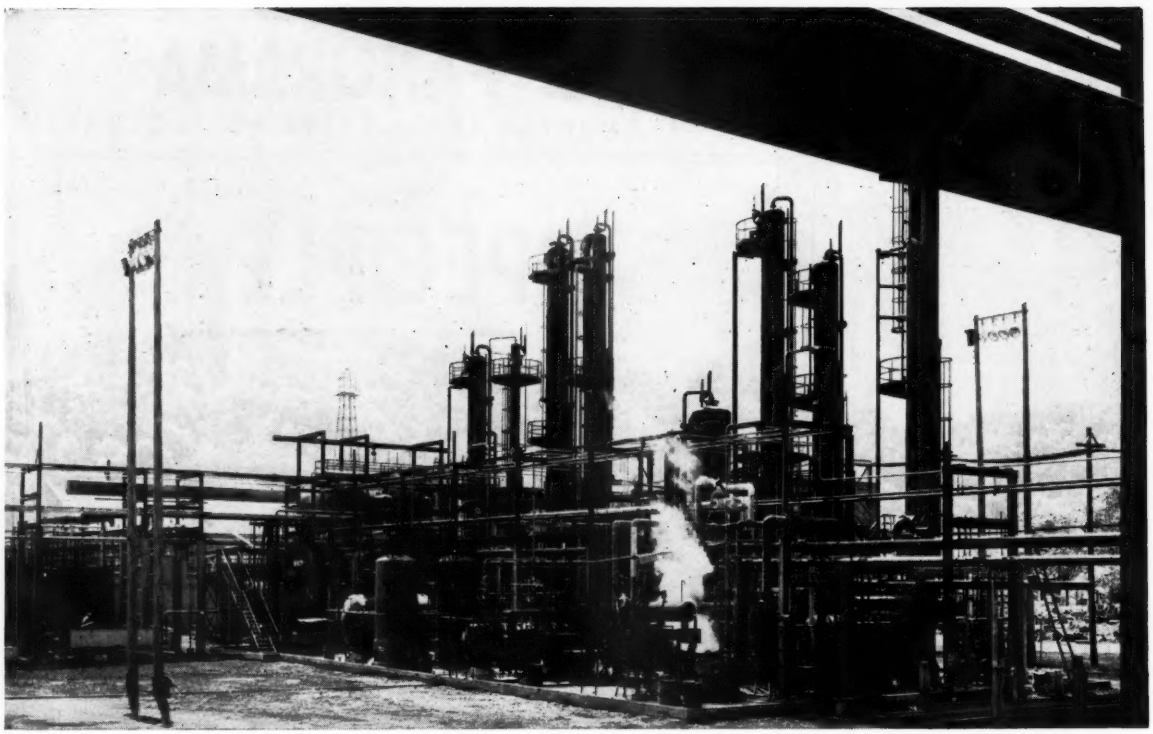
G. E. F. LUNDELL, retired chief, Chemistry Division, Bureau of Standards, to receive ACS Fisher Award in Analytical Chemistry.

W. H. SHEFFIELD, JR., formerly vice-president, Innis, Speiden and Co., has been elected president and general manager. He fills the post left vacant by his father's death.

H. M. CORLEY, recently appointed manager of the Chemical Division of Armour and Co.

CHESTER L. ARNOLD, who has been named director of research, Stauffer Chemical Co.

MALCOLM M. RENFREW, named head of the Chemical Dept., General Mills Research Laboratories. He was formerly supervisor of product development, Plastics Dept., Du Pont.



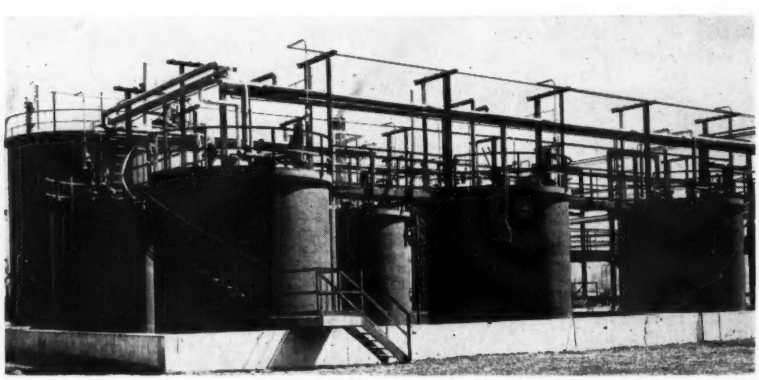
Columbia Chemical Division's new plant at Natrium, W. Va., produces mono- and dichlorobenzene and hydrochloric acid as a by-product.

Chlorinated Benzene Plant Operates

The Columbia Chemical Division of the Pittsburgh Plate Glass Co. has begun operations at its new chlorinated benzene producing plant, Natrium, West Virginia. The plant will produce monochlorobenzene, hydrochloric acid, paradichlorobenzene, and orthodichlorobenzene as co-products in a continuous process.

The new plant adjoins a chlorine and caustic soda unit constructed during the war, and substantial chlorine tonnage will be consumed daily in the manufacturing process. Supplies of benzene will come from the coking ovens of Wheeling, West Virginia, and Pittsburgh steel mills.

In the continuous chemical process, hydrochloric acid and monochlorobenzene are the first products recovered. Hydrogen chloride is recovered as anhydrous gas and then absorbed in water to produce acid of the desired strength. Monochlorobenzene is separated by distillation. Paradichlorobenzene and orthodichlorobenzene are recovered last and separated by distillation and crystallization. Estimated plant cost: over $1 million.



Tank area. Dike areas are one and one-half times larger than the capacity of the tanks. A network of Foamite lines throughout the area were installed for safety purposes.

Fractionation towers, similar to those used in oil processing, rise above the new plant.

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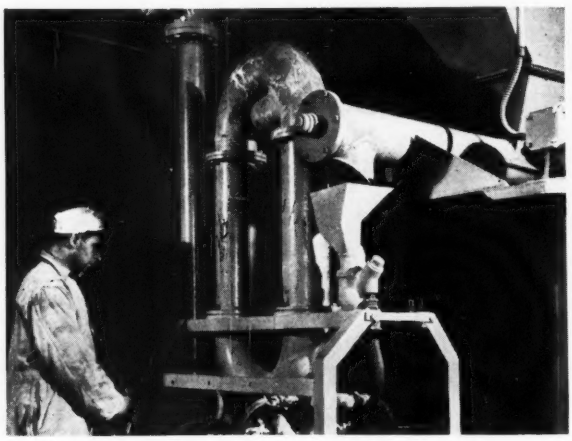
CIL Completes Pesticide Plant

Canadian Industries, Ltd., has recently completed a $500,000 pesticides plant at Hamilton, Ontario, said to be the most modern plant of its type on this continent. Installations include the most up-to-date micropulverizing, grinding, and micro-blending machinery. Many different formulations, including sulfur fungicides, benzene, hexachloride, rotenone, DDT dusts and sprays, 2,4-D and arsenical compounds are being produced.

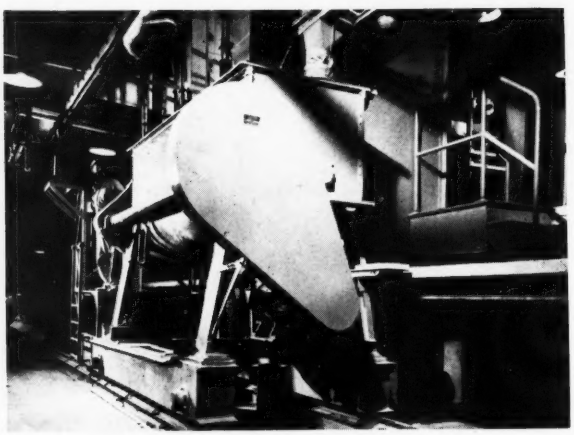
Pesticides all receive exacting treatment. Extenders and active ingredients are mixed in a primary weigh-blender mounted on a scale so each batch can be weighed automatically. In the preparation of sulfur fungicides, wetting agents are added to the sulfur to render it dispersible in water. The crude sulfur is broken up into finer lumps by a pre-crusher, then elevated to a feed hopper from which it is fed into a one-ton Raymond mill for controlled grinding into a relatively fine flour. Materials next go through the reductionizer or a micropulverizer, then to the trolley blender and the packaging equipment (see photographs).

A special section of the plant is devoted to the storage, blending and packaging of liquid formulations such as DDT emulsions, DDT household sprays, nicotine sulphate, chlordane and chlorinated camphene.

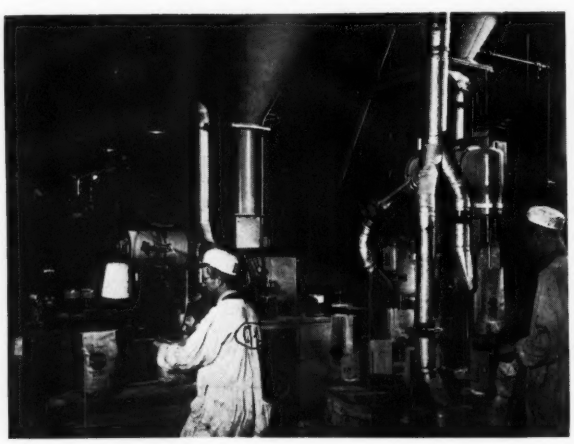
Pesticide dust is measured with Fisher sub-sieve sizer. Dusts of a particle size of less than 4 microns are formulated.



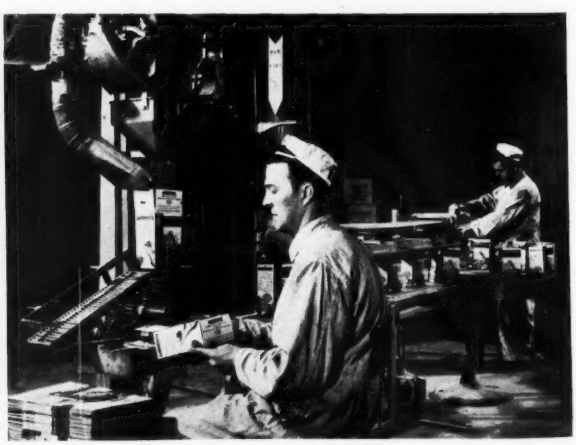
Coarse materials come down from overhead hopper and are injected by compressed air into closed tube circuit called the "reductionizer."



Electric trolley blender gives final blending to a ton batch in 5 minutes, then dumps the batch to packaging operations on main floor.



A fungicide is packaged by Packomatic machine. Bags are filled to any desired weight automatically, then sewed (see operator at left).



Cans of insecticide are filled by means of a vacuum. Spillage is sucked up by suction ducts, part of the plant's dust control system.

Right—for Rights-of-Way

and other brush control uses

Pittsburgh 10-20 BRUSH KILLER

Contains 2,4,5-T and 2,4-D Esters

Nothing is more savory than a juicy blackberry pie or the strong, sweet flavor of elderberry jelly—but the woody growth of these and other plants such as sumac, alder and osage orange can make a "jungle" out of public utility rights-of-way, grazing lands, farms and creek banks unless constantly controlled.

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***Pittsburgh* 10-20 Brush Killer is the answer to your brush-control problems. Full technical information about this effective chemical, and advice concerning its use, is available for the asking!**

10-20 Brush Killer effective on these plants:

Blackberry
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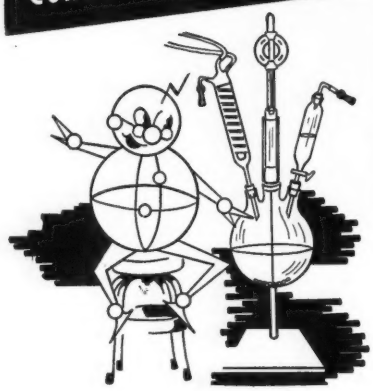

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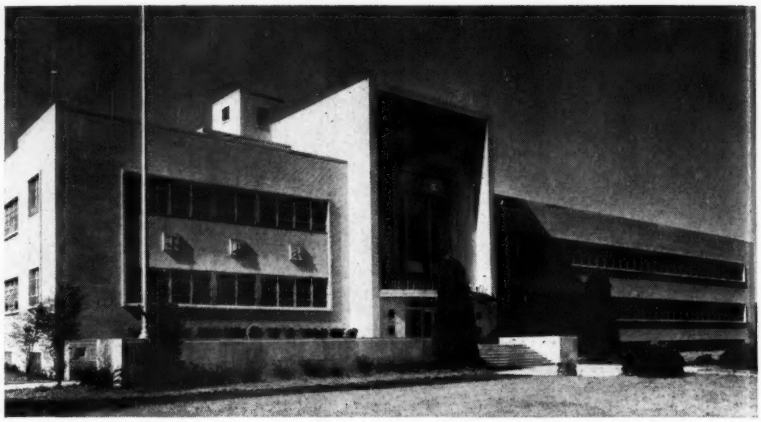
Cincinnati Chemical's Research Quarters



New headquarters of Cincinnati Chemical Works. The buff smooth finish face brick and limestone used on the principal, three-story entrance extend around the entire building.

Cincinnati Chemical Works, Inc., has transferred its offices to a new administration and research center, designed and built by the Austin Co., on Laidlaw Ave., Bond Hill, Cincinnati.

Color has been used extensively throughout all portions of the building. Corridors, stairwells, lavatories and locker rooms, as well as the research areas have been faced with ceramic tile in various color combinations. The cafeteria and interconnection ground floor meeting room have knotty pine wainscoting, green plastered walls and asphalt tile floor in a three-color parquet pattern.

Executive and business offices, in the west wing, have hollow metal partitions which can be easily shifted to facilitate any future rearrangement of offices. The sub-offices and temporary enclosures in the laboratory wing also have hollow movable partitions. The permanent partitions are of glazed ceramic tile.

Service piping, power distribution lines, and ventilating duct are carried through this area in two foot walls along the corridors.

The building has been designed for ultimate expansion to approximately twice its present floor space (67,000 sq. ft.), first by extension of the third floor, for which stub columns have been provided, and secondly, by extending the present U-shape into a hollow square.

Reception lobby is paneled in Philippine mahogany with red marble at the base. The floor is medium coral terrazzo and the ceiling is acoustic plaster in a blending color.

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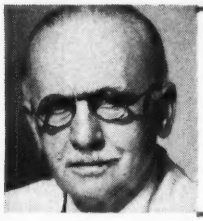

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SURVIVING A PRICE WAR, low-pressure aerosol unit sales hit 25 million as product diversification opens new markets.

USE of the aerosol method of dispersion is now entering adolescence and bids fair to reach adulthood within the next year. An infant which first saw the light of day in 1943, it is now responsible for an annual volume of about 25 million units and has become an important factor in the chemical specialties field.

Although originally introduced for the dispersion of insecticides during World War II, it is now touching on practically every avenue of daily life. Plastic sprays, touch-up paints, deodorants, moth killers, greenhouse sprays, automobile and home waxes, pharmaceutical and cosmetic products are some of the many items now being offered or planned (*CI, Feb. 1949, p. 205; CI, April 1949, p. 562; CI, May 1949, p. 741*).

HISTORY

The early history of aerosols parallels in many ways other war-born items—introduced in 1943 when U. S. Department of Agriculture scientists recommended compressed gas aerosols in small packages to enable troops in tropical areas to control insect pests responsible for malaria and other diseases. U. S. D. A. men had worked with Westinghouse Electric Corp. engineers who before the war had used a similar container to store the refrigerant (mostly Freons) used in manufacture of domestic refrigerators. The U. S. D. A. had also been working with the Surgeon General's Offices of both the Army and the Navy on better methods of dispersion of insecticides. All of this work culminated in the first production of aerosol units in the latter part of 1943.

The first bombs put out during the war were of the so-called high-pressure type, having a pressure at the orifice of 80-100 lbs. per square inch. The active ingredients were pyrethrins and sesamin, the extract of sesame oil which was used as an activator for the pyrethrins. These materials were immersed in the propellent Freon 12 (Kinetic Chemicals, Inc.'s dichlorodifluoro methane).

To assure additional sources of supply on such a strategic item, the military invited other manufacturers to produce these high-pressure bombs. Regal Chemical Corp. and Bridgeport Brass Co. teamed up to do a combination job with the latter supplying valves and containers and the former doing the packaging. Pennsylvania Engineering Co. of Philadelphia developed its own valve and container and supplied materials to the Navy towards the end of the war. Regal Chemical previously had been filling methyl bromide ampules which were used as an anti-typhus fumigant for delousing personnel and materiel.

With the end of the war and return to peace-time competition, these companies and others introduced insecticide packages for civilians which retailed in the neighborhood of $3 to $4 for a 16 oz. bomb.

Bostwick Laboratories

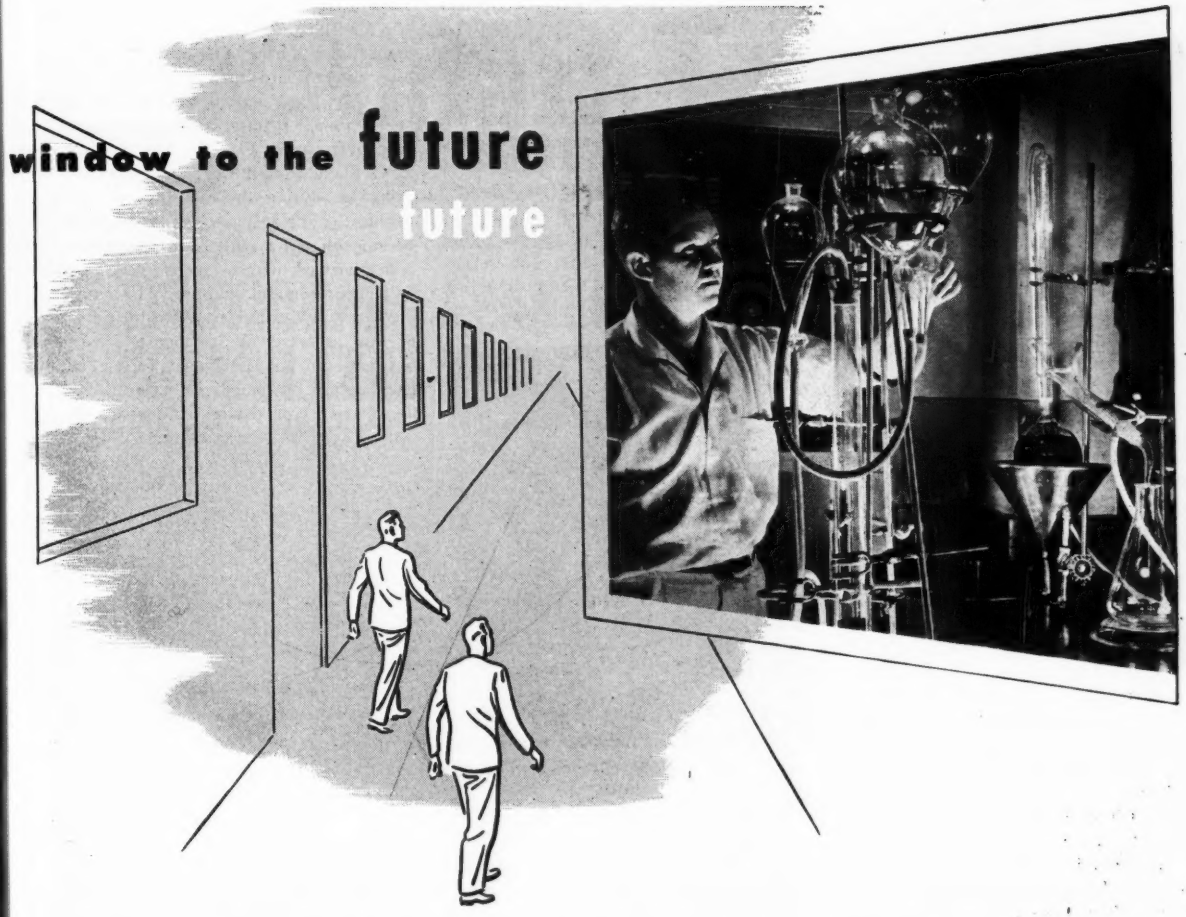
Aerosol mothproofers win acceptance.

It soon became evident that the price would have a serious effect on the large volume necessary to develop greater and more profitable distribution. In the latter part of 1946, the so-called beer can type dispenser, which depended on pressures in excess of 25 lbs. per square inch, was introduced. The first to enter this field was the Continental Can Co., followed shortly thereafter by the Crown Can Co. In order to attain the pressures required in these cans, combinations of Freon 11 (another of halogenated aliphatic derivatives developed by Kinetic for the refrigerant trade) and Freon 12 as well as methylene chloride have been used. More recently General Chemical Division of Allied Chemical and Dye Corp. introduced its new series of Genetron gases, made specifically for use in the aerosol bomb. The first of these, Genetron 102-J, is now being used commercially.

Within the last few months, the Compressed Gas Association, in cooperation with other agencies, has discussed permitting use of pressures up to 75 lbs. per square inch in beer type cans. Approval of this program will mean increased efficiency without increased expense (for heavier containers) in the low-pressure bomb.

HOW AEROSOLS WORK

An aerosol is an air colloid. It liberates in the air solid or liquid substances of low vapor pressure in such a finely divided form that they remain suspended for a relatively long period of time. Liquefied gas aerosols are produced as a result of a change from the liquid phase to the gaseous phase of a compressed and liquefied gas having a gauge pressure exceeding 25 lbs. per sq. in. at 70° F. in which has been dissolved chemicals capable of assuming colloidal par-



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ticle size when so propelled into the air and freed of their solvent.

When the chemicals dissolved in the liquefied gas are insecticidal chemicals, then the air colloid so produced is an insecticidal aerosol. If the materials are deodorants, then the resulting colloid is a deodorant. Insecticidal aerosols are subject to a patent held by the U. S. Department of Agriculture, which has granted to all producers licenses to produce and market these bombs, subject to certain rules. This regulation has had a healthy effect on the industry initially and has served to set a high standard.

PRICING PROBLEMS

After the introduction of low-pressure aerosols, an unfortunate price situation developed which hindered the industry in general in advertising and in educating the consumer on this new item. Logically, when a new material is offered to the consumer, much education in the form of advertising must be employed to create a demand, and then further advertising and publicity must follow to obtain repeat sales.

The low-pressure bomb was originally introduced at a consumer price of about $2, a price which permitted excellent formulations and sufficient margins for consumer education and advertising. The newer companies, however, in jockeying for position, tried to gain a competitive advantage by lowering the price to about $1. In cutting prices, they of course had to lower the quality of insecticide formulation. This maneuver backfired since there was not sufficient margin remaining to enable national distributors to carry on a program of advertising and consumer education, and retailers faced with a limited mark-up did not push the sale of the new product.

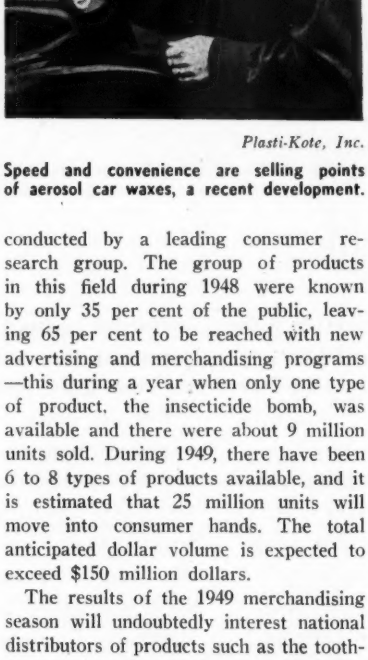
Another result of this price cutting was a tremendous amount of confusion among consumers due to variations in price and performance of aerosols. To make matters worse, there were shortages of container filling facilities and some raw materials. Hence, the volume of business done in low-pressure aerosols in the 1947 season was particularly low, and the high-pressure bomb, at a higher price, more than held its own that season.

In the 1948-49 season just passed, there was a return of logic to the field: the retail price was stepped up to the $1.25 to $1.50 range. However, there are still lower priced formulations which do not have the wide popularity enjoyed by superior materials.

AEROSOL RESURGENCE

Most important in the resurgence of the low-pressure aerosol has been the introduction of materials other than insecticides. This has helped both manufacturer and distributor as well as retailer because now there is a year-around sale of aerosol items rather than just the seasonal sale characteristic of insecticides. Filling plant facilities now operate 10 to 11 months a year instead of 3 to 4 months as in the past.

The potential market of aerosol bombs is indicated in the results of a survey sponsored by one of the companies engaged in supplying raw materials, and



Plasti-Kote, Inc.

Speed and convenience are selling points of aerosol car waxes, a recent development.

conducted by a leading consumer research group. The group of products in this field during 1948 were known by only 35 per cent of the public, leaving 65 per cent to be reached with new advertising and merchandising programs —this during a year when only one type of product, the insecticide bomb, was available and there were about 9 million units sold. During 1949, there have been 6 to 8 types of products available, and it is estimated that 25 million units will move into consumer hands. The total anticipated dollar volume is expected to exceed $150 million dollars.

The results of the 1949 merchandising season will undoubtedly interest national distributors of products such as the toothpaste and soap who have watched this field but who apparently have taken no active part in these products to date. Certainly, this field holds much promise for their type of promotion and merchandising, and there are many products which lend themselves to consumer use through aerosol dispersion.

COMPANIES

At present there are several companies which entered this new specialty field in the early stages and logically will remain. When the sole product was insecticides, the dominant position was retained by Westinghouse as a result of its activity during the war. Bridgeport also entered into civilian distribution of the "bug bomb" after the war. At the same time, Pennsylvania Engineering, Knapp-Monarch Co., Gulf Oil Corp., Esso Standard Oil Co., and others also joined in during the high-pressure type popularity. Bridgeport and Penn Engineering offered a refillable type container which enabled the consumer to save about half the original purchase price by returning the empty container. With the advent of low pressure, Westinghouse dropped out entirely but Bridgeport and Penn Engineering continued the production of the heavier type device. Bridgeport also went in for low-pressure units and was joined by Gulf Oil Corp., Esso, Connecticut Chemical Research Corp. and its selling subsidiary Bostwick Laboratories, Rex Research Corp., Standard Oil Co. of Ohio, Standard Oil Co. of Indiana, Eston Chemicals, Inc., and others. Many of these were in distribution of conventional type insecticides, but for such as Bridgeport, Knapp-Monarch, and Connecticut Chemical, the insecticide business was a new venture. The latest addition to the field on a national scale is General Chemical.

The specialized type of equipment and know-how required in aerosol manufacture has fostered the growth of private label organizations. The pioneer in this was the Regal Chemical Co. of Brooklyn, N. Y. During the war it supplied packaging know-how to Bridgeport Brass; afterwards it continued in the field and now has a dominant position in supplying packaging for others. Another organization, the Continental Filling Corp., Danville, Ill., was formed in 1947 at the time the low-pressure beer type can was introduced, and has been a major producer of materials distributed in the midwest. Many of the firms selling their own brands also fill for others, and this type of service is growing.

THREE CASE HISTORIES

A brief look at three of the national distributing factors will show how and why they entered this field.

Bridgeport's entrance into this field resulted from the 84-year-old brass company's plan to diversify (*Fortune, July 1949, p. 70*). Bridgeport's heavy volume being in the fabrication of semi-finished metal shapes, it was subject to unsteady demand and fluctuations in price of metals. In 1930 it began manufacturing the first of its so-called finished products, tire valves, and later, products like flashlight cases, plumbing pipes and condensers. During the war, Bridgeport's experience in tire valves and in the deep-drawing of metal made it a natural for it to develop and make the bombs, spray

Antara Products
General Aniline & Film Corporation

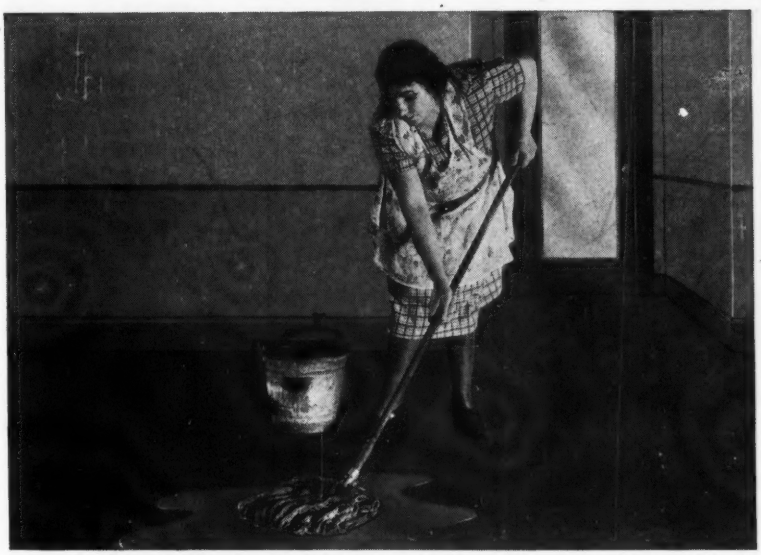
Antara Extra

An Antara Products Publication

Detergents
Emulsifiers
Wetting Agents
Dispersants
Carbonyl Iron Powder

444 MADISON AVENUE NEW YORK 22, N. Y. SEPTEMBER, 1949

INSTITUTIONAL CLEANERS AMONG BEST SELLERS FORMULATED WITH ANTAROX DETERGENTS



Antarox "A-180" is excellent for compounding hard surface cleaners—for rubber, marble, tile, porcelain, terrazzo, etc. On applications such as illustrated above, it is far superior to soap powder because of its efficiency and because it cuts down labor costs. A typical solution contains one tablespoonful of Antarox "A-180" in a bucket of water.

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The four non-ionics, known as Antarox A-400, A-480, A-200, and A-180, are aromatic polyglycol ethers. They are all excellent hard surface cleaners. Among the commercial products compounded with them are floor cleaners, wall cleaners, all-purpose office cleaners, terrazzo cleaners, painted surface cleaners, dishwashing compounds, window cleaners and automobile cleaners.

Sold by Antara Products, General Aniline & Film Corporation, 444 Madison Ave., New York 22, the Antarox "A" series are liquids which are unaffected by hard water. They have many advantages in the compounding of institutional cleaners. Good for most any types of floors, they give outstanding results in cleaning. They will not etch the surface of marble or terrazzo, even after long usage.

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As an outstanding synthetic tackifier for GR-S, Koresin played an important part in the production of rubber during the war years. Its unique properties attracted the interest of paint and varnish manufacturers, ink makers, chewing gum manufacturers and others.

Koresin has a melting range of 120-160°C. It is soluble in hydrocarbons, drying oils, ketone, esters and sec-butanol. It is compatible with GR-S, oil-soluble phenolics, coumaroneindene resins, polyvinyl butyral, polyvinyl chloride, methyl methacrylate, ethyl cellulose. It is available in commercial quantities in 350-lb. Fiberpaks from the Grasselli plant.

For information and prices, write, outlining your specific problem, to Antara Products, General Aniline and Film Corporation, 444 Madison Ave., New York 22.

Carbonyl Iron Powders Offered as Chemicals

Carbonyl Iron Powders, long produced at the Grasselli, N. J. plant of General Aniline & Film Corporation solely for use in high frequency cores for electronics, now are available for chemical use.

Until early this year, the company explains, the entire production of carbonyl iron powders was taken up by the electronics industry. GA&F's newly-leased plant at Huntsville, Alabama makes it possible to offer the material to other industries.

Carbonyl iron powders are made from liquid iron pentacarbonyl and are unique in that the particles formed are spheres and free of non-ferrous metals. Companies interested in this remarkably pure form of iron are invited to write for information.

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For test samples and prices write: J. T. Baker Chemical Co., *Executive Offices,* Phillipsburg, New Jersey.

Baker's

Baker's Chemicals

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valves and metal cartridges, and it eventually took on the job of filling them also. At the end of the war, Bridgeport established an "Aer-a-sol Division." It also followed into the moderate priced low-pressure type, offering two sizes, the normal 12 oz. and a smaller 4 oz. item. The company has developed 17 additional types of sprays employing the aerosol method of dispersion. Most of them are in the planning stage, but a few of the newer products have already appeared during the past season. Bridgeport has underway an intensive research program and is in this field to stay.

General Chemical Division of Allied Chemical and Dye Corp., important in the distribution of industrial chemicals, has moved into this new field with all of its heavy guns. Its primary interest stems from the raw materials that go into this finished product—it has been interested in fluorine chemistry for several years, having been one of the largest producers of industrial fluorides, and its new Genetron gases are a natural outgrowth of this interest. Its Mechling Division is a large producer of agricultural insecticides as well as household insecticides. Thus the new aerosols will expedite movement of its basic products and eliminate some steps in the distribution pattern.

General pioneered a new container deloped in conjunction with Reynolds Metal Co. It is a polished aluminum seamless dispenser that weighs 1½ ozs. empty. It is but 2½ inches in diameter so that it fits snugly into a woman's hand, and has several other features which help greatly in its appeal to the consumer. As in the case of Bridgeport, General has set up a separate department to handle this new field of products with the eventual aim of having upwards of 10 different preparations employing the same type container, the differences being noted by colors.

Connecticut Chemical Research was originally started as a research and engineering organization to furnish specialty companies with private label products. However, after initial production began, the company decided to enter the retail market itself and organized a sales subsidiary, the Bostwick Laboratories, Inc., which has introduced many new products. The initial product, the Hep Insecticide Bomb, was followed soon by its Hero Fire Extinguisher, which employs carbon tetrachloride as the extinguisher fluid with small amounts of carbon dioxide as the propellent. These are only two of many new products which it has pioneered.

PRESENT AND FUTURE

The efforts of the many companies in the field searching for new products to provide a year-round demand gave the industry its first substantial foothold in the mass market this past spring. The wide variety of aerosols introduced, and their good consumer acceptance, showed that this dispersion method could be a potent factor in marketing chemical specialties.

Producers, distributors and retailers have largely recovered from their growing pains, and the bad taste left over by the price war of the previous season has been sweetened. With re-establishment of more reasonable profit margins last spring, it was once again possible to carry on advertising and education programs. Now it is generally conceded in the industry that insecticides will eventually contribute but a minor volume of the total output of such products.

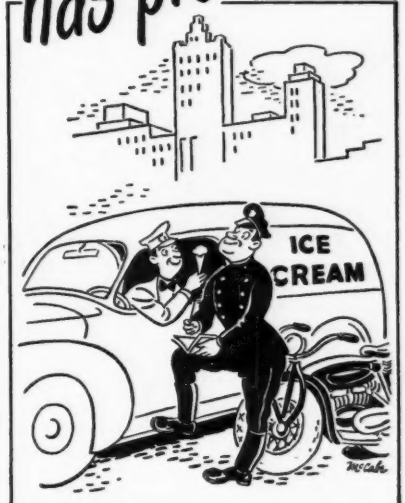
A resume of some of these newer products follows:

1. Specialized insecticide formulations—with and without DDT; with methoxychlor (Du Pont's answer to the DDT toxicity problem); wih DDT and chlordane to be used as a surface coat (not a true aerosol) to combat crawling insects.
2. Mothproofer — containing various ingredients (usually DDT and pyrethrins, or methoxychlor) having repellent or insecticidal effect on moths.
3. Sun tan lotion that requires no rubbing.
4. Insect repellent materials that require no inconvenient and messy application.
5. Space deodorant and air fresheners—both chemical adsorptive and absorptive as well as the masking type.
6. Plastic coating—to protect various surfaces by the application of a thin film of a flexible protective resin.
7. Non-rubbing polish and wax for furniture and automobiles.
8. Fire extinguisher employing various chlorinated type materials plus a propellent such as CO_2 (not a true aerosol).
9. Perfume "bombs" for personal use.
10. Paints and enamels, including touch-ups.
11. Underarm deodorants.
12. Hair waving compounds and other hair preparations.

Where this new specialty field is headed is nearer a solution now than before the advent of the newer products discussed above. At first, this whole idea was treated as "a gadget" and a "lazy man's way" to dispense chemicals. But Mrs. Consumer is beginning to appreciate the convenient push-button method of ridding her home of flies and mosquitoes, her closets of moths, her kitchen of odors; waxing a floor by "truly no rubbing"; protecting various items in the house from wear and corrosion; touching up painted surfaces; and dispensing various toiletries, cosmetics and pharmaceuticals. Though she's paying $1.50 to $2.00 for these various containers, no doubt increased production and more ingenious devices will eventually enable her to buy the product for "a dollar." Then the bombs will have found their place.

Meanwhile, this specialty represents a real market for chemicals—for the active ingredients, for propellents, for solvents, and for the plastic cap used to safeguard the valve of the container.

Everyone has problems



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New Weed-Killers Find Expanding Uses

NEW CHEMICALS and new applications for older compounds expand potential of weed-killers, portend big foreign market.

REPLACING hand or mechanical weeding with chemical control has been one dream brought within the realm of possibility by the "agricultural chemicals revolution" of the past decade. It has provided a profitable new field of expansion for chemical companies alert enough to hire or develop staffs trained in agronomy and wise in the farmer psychology. Those that have blended their chemistry with agriculture are finding growing markets not only in weed control in crops, but along roadsides, rights-of-way, railroads and ponds and in such places as waterways and irrigation ditches.

In a recent *Chemical Industries* interview, L. W. Kephart, Beltsville, Md., who is in charge of weed control investigations for the United States Department of Agriculture, indicated that there are about 150 million acres of land that should be cleared of weeds and brush for grazing or to keep fire lanes, telephone lines, power lines and the like free. An even greater market exists overseas in all areas, but particularly in the tropical belt where the stubborn weedy grasses have prevented utilization of land for such valuable crops as sugar cane, rubber, coffee, cocoa, and plants for botanical drugs. Marginal plantations neglected by Japanese occupation forces need these chemicals, as does the land in Africa that Britain is attempting to recover from wilderness in its "groundnuts plan." Although dollar shortages are at present a bar, if "point four" of the Truman Plan is vitalized with credits, a good export demand should develop.

The Dow Chemical Co.

Right plot spaded before spraying with Sodium TCA 70%; left plot, spaded but not sprayed.

RECENT GAINS

Although the salts and esters of 2,4-D (2,4-dichlorophenoxyacetic acid) were the prime factors in the initial expansion of selective weed- and brush-killers, others are now in large volume use. 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) which is generally more effective than 2,4-D against brush is being used more extensively in such jobs as clearing fire lanes and rights-of-way for utility companies. Even if the cost of such applications runs as high as $15-20 an acre, it is cheaper than the older hand or mechanical methods. Large areas covered by mesquite in Southwest Texas and by sagebrush in Idaho could probably be turned into valuable grazing land by this chemical, but the cost would have to be in the $3 per acre range. Willows and other brush that plug irrigation ditches can be removed with 2,4-D or 2,4,5-T, and these herbicides are widely employed. Ammonium sulfamate is another chemical going over in a big way because of its quick knockdown of brush as well as weeds.

The most recent development has been the commercial introduction of the sodium salt of trichloroacetic acid (TCA) (*CI, April 1949, p. 566*) which is effective against perennial and annual grasses. It is expected to supplement sodium chlorate, which has a fire hazard, and sodium arsenite, which is poisonous, in controlling grasses along railroads and highways and around industrial property. In combination with a weed-killer such as 2,4-D, it gives good overall clearing, and may be used on some crop lands prior to planting without soil sterilization.

Initially available from the Du Pont Co. and The Dow Chemical Co. as the 60 and 70 per cent sodium salt respectively, the sodium salt of TCA is now being offered in purity greater than 90 per cent by the Oldbury Electro-Chemical Co., Niagara Falls, N. Y., as well as by Dow.

Where soil sterilization is desirable, as around fence posts, telephone poles, lumber yards and railroad yards and along pipe lines, Pacific Coast Borax Co. has a series of boron-based compounds that contain boron derivatives alone or in combination with sodium chlorate. These materials do not have the objectionable fire hazard of the chlorate alone, and recently have won wide acceptance.

PETROLEUM FRACTIONS

Not to be overlooked among selective weed-killers are the expanding aromatic petroleum products. Since Stoddard solvent was discovered to be a good substitute for the back-breaking job of weeding carrots about nine years ago, other petroleum fractions have been found good for control of grasses. This latter application can be most important since crab grass in cotton is a serious bottleneck in mechanization of cotton picking. In addition to this big potential use, large gallonages of aromatic solvent emulsions are being sprayed under water at the heads of canals and irrigation ditches to kill aquatic weeds blocking the flow. These aromatic naphthas are effective for a year, and weed roots are killed off in two, but crops utilizing such water are unaffected. A good material to kill such plants in ponds and lakes where there is no flow (and the oil emulsion rises to the top) is still needed. Demand has exceeded the amount of petroleum-type weed-killers that oil companies have produced.

In solving the problem of crab grass in cotton, TCA too is being tried out, and the dinitro weed-killers, particularly sodium dinitro-*o-sec*-butyl phenolate, seem promising although their use will involve an adjustment of planters if the treatment becomes standard.

COMBINATION TREATMENT

The clearing of water hyacinth from the bayous of Florida and Louisiana that are the lifeblood of commerce in certain areas there represents another big potential field. Mr. Kephart holds this up as a fine example of the combined use of mechanical and chemical methods. Boats with cutting devices are the most economical means for clearing the middle of the streams, but they do not get the banks or swamps. Here, spraying with 2,4-D is excellent complementary treatment.

Related to finding the proper niche for a particular chemical in a given weed control problem is the necessity for seeing that drift from sprays of airplanes does not damage crops sensitive to the material. Improper application by unqualified or careless operators has brought about strict regulations on the use of 2,4-D in several states, and has undone much of the educational work of the U.S.D.A. and chemical companies in this field. Both government and industry are working to avoid any further unfavorable developments of this nature that may curtail proper use of such materials.

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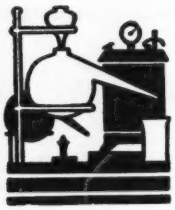

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SPECIALTIES NEWS

Pesticide Investigation Likely

A resolution almost identical with the Keefe resolution to create a special committee to investigate the toxicity of pesticides, chemical food emulsifiers, and fertilizers, has been introduced by Congressman Adolph Sabath. Congressman Sabath is a prominent Democrat and Chairman of the House Rules Committee, the committee in which the Keefe resolution has lain dormant. These circumstances indicate strongly that this resolution may be given clearance for action by the House prior to the adjournment of Congress and thereby clear the way for such an investigation during the recess.

Hyman Trade Names Compounds 118 and 497

Julius Hyman & Co., Denver, Colo., has given trade names to its two new insect toxicants which have been previously identified as Compounds 118 and 497; henceforth, Compound 118 will be called Octalene and Compound 497, Octalox. Both of these chemicals have been and are being widely used experimentally in the United States and abroad.

The company expects to be in commercial production of these chemicals for the 1950 season. Data sheets giving comprehensive information about the physical and chemical properties and the insecticidal activity of Octalene and Octalox are available from the company upon request.

Bostwick Labs Wins Aerosol Patent Suit

An infringement action concerned with patents in the field of aerosol-dispensed products, brought by the Bridgeport Brass Co. against the Bostwick Laboratories and its parent corporation, the Connecticut Chemical Research Corp., both of Bridgeport, Conn., has been won by the defendants. Bostwick's $100,000 counterclaim against Bridgeport Brass is pending.

Chief Judge C. C. Hines of the U. S. District Court, District of Conn., ruled in favor of Bostwick Laboratories and Connecticut Chemical Research on the ground that the two Bridgeport Brass patents involved in the case were invalid because they were in the field of prior art and showed no invention over specific prior patents long since expired and therefore in public domain.

A. O. Samuels, president of the Connecticut Chemical Research Corp., revealed that his company has on file a $100,000 counterclaim against Bridgeport Brass Co., alleging that during the past year agents of that company verbally and erroneously told retailers and jobbers of Bostwick's aerosol products that they could be sued for infringing on Bridgeport Brass patents. Bostwick claims $100,000 sales were lost because of this. Decision on counterclaim is pending.

W. A. La Lande, Jr. (left), director of research and development, Pennsylvania Salt Manufacturing Co., elected chairman of the Philadelphia Section of the American Chemical Society, and Percy L. Larsen, appointed Sharp & Dohme, Inc.'s San Francisco district sales manager.

Du Pont Ups Methoxychlor Capacity

Additional facilities for the production of methoxychlor, basic ingredient for a new line of insecticides, and methoxychlor compositions are scheduled to be in operation at the Linden, N. J., plant of the Grasselli Chemicals Department of the Du Pont Co. late this fall.

The Du Pont Company introduced methoxychlor in 1947, after five years of investigation of insecticidal efficiency, crop safety and toxicity to warm-blooded animals. The U. S. Department of Agriculture in April of this year recommended its use on dairy animals, dairy barns, on forage to be fed to dairy animals, and on other animals being finished for slaughter. Although the present facilities at the Grasselli works in East Chicago, Ind., are producing substantial quantities of methoxychlor insecticides, they have proved to be insufficient to meet the present demand.

Warwick to Distribute Sugar Cane Wax

The Warwick Wax Co., Inc., Long Island City, N. Y., subsidiary of Sun Chemical Corp., will distribute a sugar cane wax manufactured jointly by the Cuban-American Sugar Co., N. Y. C., and S. C. Johnson & Son, Inc., Racine, Wis. Sugar cane wax produced at a newly constructed refinery at Gramercy, La., has characteristics similar to carnauba and ouricury vegetable waxes.

Now! you can cook better varnishes *at less cost!*

NEVILLE LX 685 RESIN

gives you an unusual opportunity to cook better varnishes for the manufacture of Floor and Concrete Paints, Porch and Deck Enamel, Metal Primers, Gasoline and Grease-Proof Coatings, Chassis Blacks and Fast Drying Aluminum Paints. *And you can do it at less cost!*

Neville LX 685 is a neutral, unsaponifiable and heat reactive resin. Its unique drying influence on drying oils makes it possible to use appreciable amounts of the more economical Soya Bean Oil, with practically no sacrifice in final dry, and inexpensive mineral spirits may be used as the entire solvent.

SPECIFICATIONS

Melting Point; (Cube-in-Mercury).....110°-130°C
Color; Resin, (Neville Method).....2-4
60% solution in mineral spirits (Gardner Method).....14
Acid No.....Less than 1
Saponification No.....0
Iodine No.....100 to 110
Av. Sp. Gr. at 25° C.....1.122
Av. wt. per gal.....9.35 lbs.

VARNISH CHARACTERISTICS

- Fast Drying
- Good Light Stability
- Excellent Resistance to
  - acids
  - alcohols
  - alkalis
  - gasoline
  - grease
  - water

Available in quantity for immediate shipment at only 12¢ LB.
(in drums of 450 lbs., F.O.B. Pittsburgh)

Contact us or our representatives today for samples and formulation data

THE NEVILLE COMPANY
PITTSBURGH 25, PA.

RESINS—COUMARONE-INDENE • MODIFIED COUMARONE-INDENE • PETROLEUM • ALKYLATED PHENOLS
OILS—SHINGLE STAIN • NEUTRAL • PLASTICIZING • RUBBER RECLAIMING • CREOSOTE
SOLVENTS—2-50-W HI-FLASH • CRUDE & REFINED COAL-TAR • WIRE ENAMEL THINNERS
SPECIALTIES—PHENOTHIAZINE • RUBBER COMPOUNDING MATERIALS • TAR PAINTS

Chemicals for the Nation's Vital Industries

A-33

N. Y. C. Board Approves Lighter Fluid Capsules

The Board of Standards and Appeals of the City of New York has approved for use in that city Tyesules, lighter fluid capsules manufactured by John Tye & Sons, Ltd., London, England. Tysules are made of gelatin and contain one-seventh of an ounce of shell lighter fluid; each capsule is hermetically sealed. They are individually packed in egg-crate fashion, 144 ih a heavy gauge sheet metal box. One gelatin capsule constitutes one filling of fluid for a cigarette or cigar lighter.

Discussing Wood Cream, new product of Gold Seal Co. (see p. 386), are left to right, Ray O. Mithun, Campell-Mithun, Inc., advertising; Stewart Hollingshead, president, R. M. Hollingshead Corp.; Harold Schafer, Gold Seal president; T. S. Kleppe, Gold Seal vice-president and treasurer; and Richard M. Hollingshead, Hollinghead chairman of the board.

Licenses Available for Schering Patents

The Alien Property Custodian has decided that Schering Corp. shall license every United States drug manufacturer to use the hormones *alpha*-estradiol, estradiol benzoate, ethinyl estradiol and progesterone, by paying a reasonable royalty while a manufacturer of the bulk hormone is permitted to use those patents without license or royalty payment upon securing permission from Schering. The licenses are to be uniform for the trade.

Chemical Specialties Co., Inc., and Mann Fine Chemicals are two of the companies who will continue to manufacture and sell these hormones in bulk to pharmaceutical companies. Their customers will apply to Schering for license to resell the hormones in final packaged form as pharmaceutical products.

Merck Cooperates with Committee on Cortisone

The committee appointed by the National Academy of Sciences to allocate Cortisone will be given full cooperation by Merck & Co., Inc., according to George W. Merck, president. He said that this committee provides an orderly means for advancing knowledge of this new hormone and best serves the public interest. The company supplied Cortisone to the Mayo Clinic in September 1948 for the first clinical studies in rheumatoid arthritis.

Companies

The corporate name of Leon Finch, Ltd., Los Angeles, Cal., has been changed to American-Marietta Co. of California. In October, 1945, the American-Marietta Co. acquired the ownership and has operated Leon Finch, Ltd. as a wholly-owned subsidiary.

The Tamms Silica Co., Chicago, Ill., has changed its name to the Tamms Industries, Inc., because of increased diversification. Its operations were originally limited to new materials and silica, but it gradually increased manufacturing to include water paints, colors, and sundry products.

The General Electric Co. is establishing a warehouse for servicing middle-western G-E Glyptal alkyd resin accounts at the Decatur, Ill., plant of the plastics division of the company.

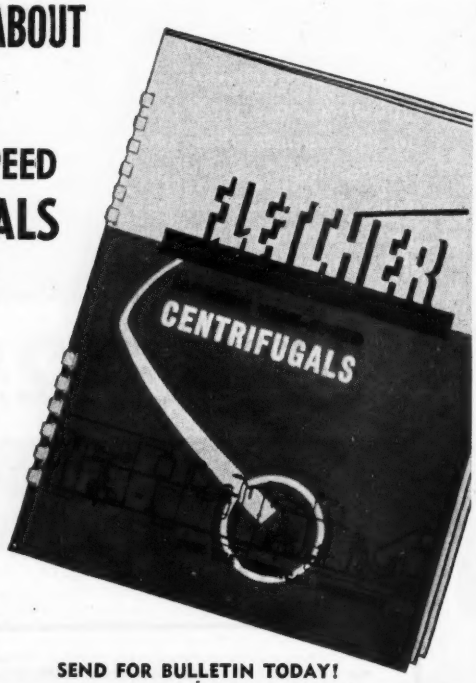
Borden's Durite products sales offices will be moved from Philadelphia, to the

CONTAINS *Facts* ABOUT

Fletcher

HIGH SPEED CENTRIFUGALS

This booklet contains down-to-earth facts, substantiated with clearly understood photographs and drawings on Fletcher Centrifugals. Before you specify *just any* Centrifugal, send for this illuminating booklet . . . *see why Fletcher Centrifugals are recommended and widely used in the chemical industry.* It's free—Write for it, on your business letterhead, please.

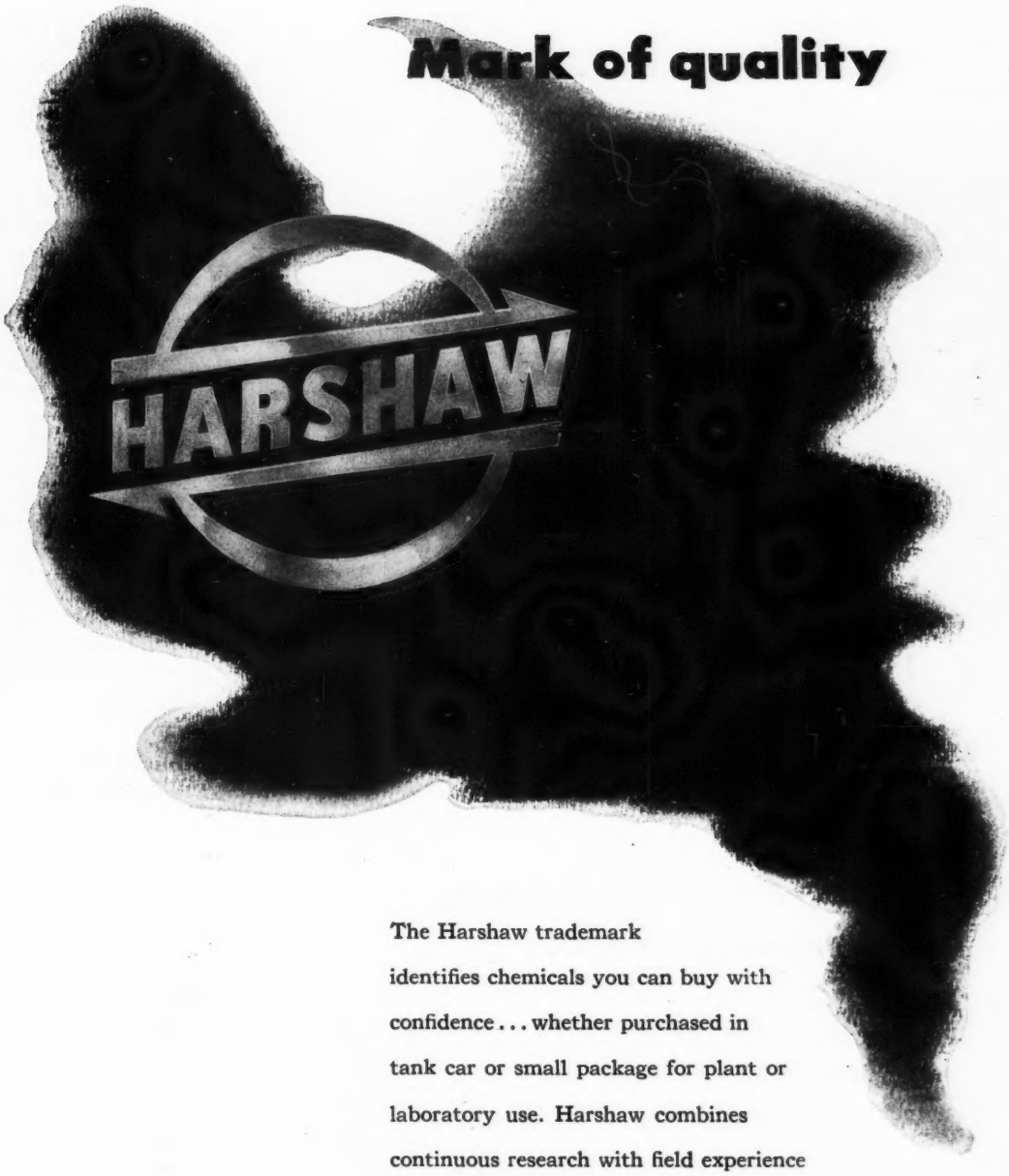


SEND FOR BULLETIN TODAY!

FLETCHER CENTRIFUGALS

FLETCHER WORKS, 261 GLENWOOD AVE., PHILADELPHIA 40, PA.

Mark of quality



The Harshaw trademark identifies chemicals you can buy with confidence . . . whether purchased in tank car or small package for plant or laboratory use. Harshaw combines continuous research with field experience and modern facilities to manufacture products which have earned the confidence of an ever-increasing list of satisfied customers. Specify Harshaw on your next order.

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

main offices of the Borden Co.'s. Chemical Division at 350 Madison Avenue, New York 17. Sam Gurley, Jr., Durite products sales manager, will conduct all future business from the new address.

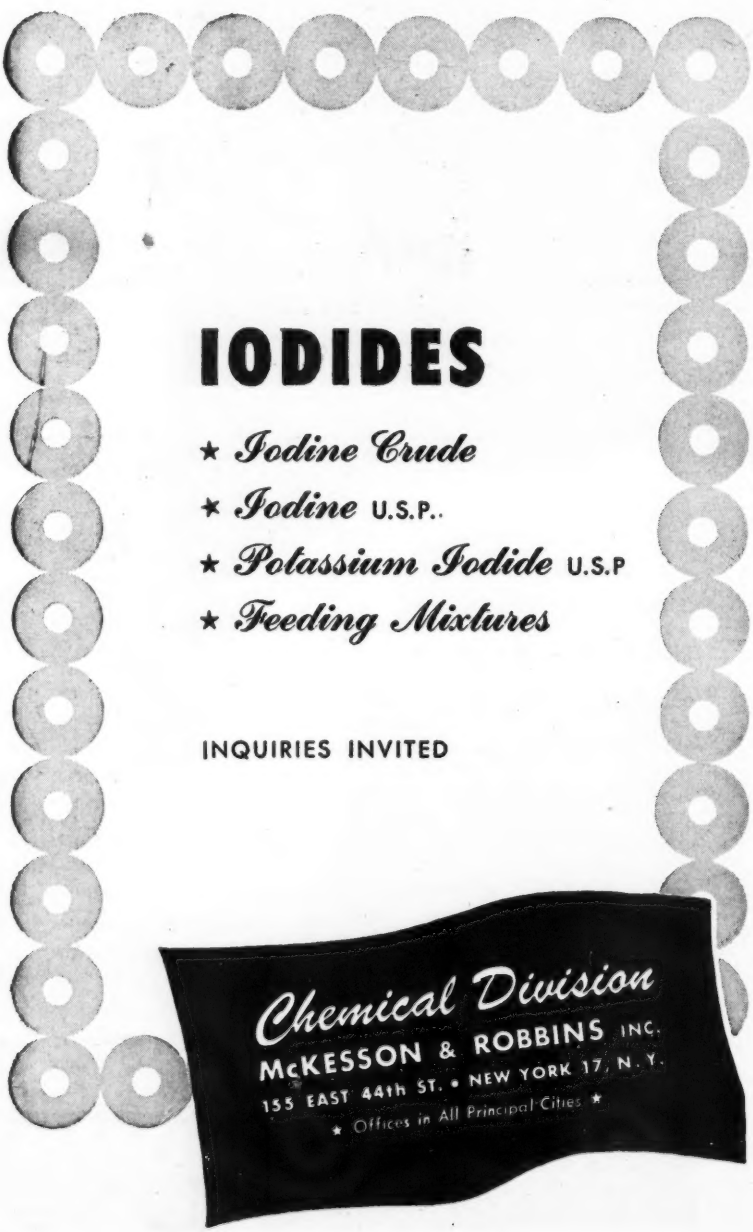
Personnel

• L. H. Wright has been named manager of the Fertilizer Sales Division of **Phillips Chemical Co.**, Bartlesville, Oklahoma. From May, 1946, to the present time he has been assistant manager of the Philgas sales group.

• Charles L. Czermak has been named associate sales manager of **George A. Breon & Co.**, manufacturing pharmaceutical chemists. Mr. Czermak, who joined the Breon sales force in 1946, will assist in the planning of sales and merchandising activities and in the supervision of the sales personnel.

• R. L. Jones, has been appointed Western regional sales manager for **Lever Brothers Co.**, with offices in Kansas City. He formerly was divisional manager in Chicago.

• Rudolph J. Pauly, formerly director of the School of Pharmacy of the American University of Beirut, Lebanon, has joined the staff of the **Sterling-Winthrop Research Institute.** He will serve as assistant director of the Pharmaceutical Division.



NEW CHEMICAL SPECIALTIES

Note: This section limited to new finished specialties. New raw materials and intermediates of interest to specialties manufacturers are described in New Products and Processes department.

Furniture Polish

Combination cleaner-polisher for finished wood introduced by Gold Seal Co.

The Gold Seal Co., whose "Glass Wax" created merchandising history in 1948 (*CI, Dec. 1948, p. 933*), is introducing a new product, "Wood Cream," which cleans and polishes woodwork, furniture, enameled and other surfaces (see picture on page 384).

Sold through grocery, hardware, drug, variety and department stores, it will be fair-traded at 59 cents a pint and provide the same discounts as "Glass Wax." A 10-cents trial offer is being made on the Arthur Godfrey radio program."

Among the strong selling points that will be stressed in the promotion of "Wood Cream" are its quick and easy dual cleaning and polishing action, its many uses for many different surfaces and the fact that it does not leave an oily film to attract dust and show fingermarks.

Aerosol Insecticide

General Chemical markets Airex Insect Killer.

Airex Insect Killer a household aerosol insecticide, is being marketed by General Chemical Division, Allied Chemical & Dye Corp., New York. Packaged in a light aluminum container, the formula is effective against both flying and crawling household pests. Incorporating the new dispersant Genetron, the new bug killer is said to provide enough mist in one 12-oz. dispenser to keep the average home insect-free weeks at a time, for as little as a penny and a half a treatment. Department, drug, grocery, hardware and paint stores will feature Airex, fair-traded at $1.69.

Adhesive for Pre-Cementing

Non-blocking adhesive permits pre-cementing of materials for later assembly.

H-511 Ubabond, a synthetic rubber cement developed by the Union Bay State Chemical Co., 50 Harvard St., Cambridge, Mass., makes possible the pre-cementing of many materials. Upon application the adhesive dries to a non-tacky condition after a period of from 15 to 30 minutes at room temperature. Thus, either handling the pre-cemented materials on an

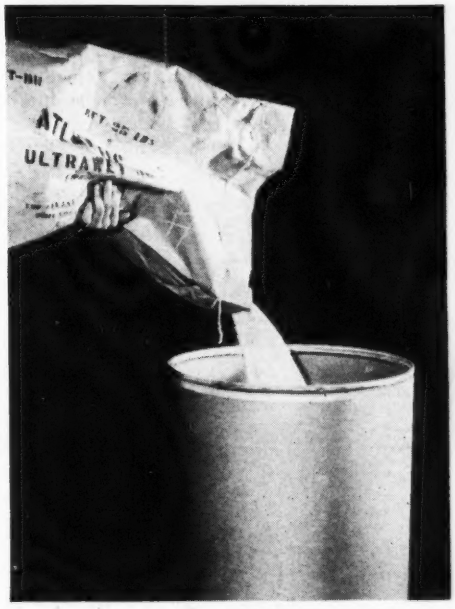
ATLANTIC PETROLEUM CHEMICALS

ULTRAWET SK

YOU PAY NO MORE FOR THIS DEDUSTED BEAD

When dry mixing you probably like detergents in bead form because of their free-flowing properties and the improvement in appearance of your finished compound. You probably haven't liked their excessive dust. *Now* you can have a bead from our new spray tower that flows freely . . . mixes easily . . . looks well . . . and is *virtually dustless*. It's *improved* ULTRAWET SK bead.

This new Atlantic development, a result of extensive experience in the science of spray drying, is available to you at no extra cost. You pay no more for *this* dedusted bead. A note on your letterhead will bring a sample.



● APPLICATIONS	● ULTRAWETS					
Form:	30E Liquid	30DS Liquid	35K Liquid	SK Bead	DS Flake	K Flake
Minimum % Solids:	30	30	35	35	85	85
Minimum % Active-Solids:	85	85	90			
EMULSION BREAKING	✓					
LIGHT-DUTY HOUSEHOLD DETERGENTS			✓	✓		
PENETRANT	✓	✓				
INDUSTRIAL DETERGENTS					✓	✓
HEAVY-DUTY HOUSEHOLD DETERGENTS			✓			✓
EMULSIFIER					✓	✓
WETTING AGENT	✓	✓				
CHARGE STOCK FOR SPRAY AND DRUM DRYING			✓			
DRY MIXING WITH ALKALIS				✓	✓	✓
LIQUID HOUSEHOLD DETERGENTS		✓				
COUPLING AND SOLUBILIZING	✓					

For samples, further information and quotations, communicate with

THE ATLANTIC REFINING COMPANY

Chemical Products Section

260 South Broad Street, Philadelphia 1, Pa.
Chamber of Commerce Building, Pittsburgh 19, Pa.
Hospital Trust Building, Providence 1, R. I.
1112 S. Boulevard Street, Charlotte 3, N. C.
111 W. Washington Street, Chicago 2, Ill.

L. H. BUTCHER COMPANY • San Francisco • Los Angeles
Seattle • Salt Lake City • Portland • Oakland

NAUGATUCK CHEMICALS
Division of Dominion Rubber Co. Ltd., Canada
Elmira • Montreal • Toronto • Windsor
Winnipeg • Saskatoon • Calgary

assembly line or shipping them for later assembly becomes feasible. Yet, when the pre-cemented surfaces are to be joined together, reactivation can be accomplished easily and quickly by heating the "dead" surfaces under infra-red, steam or dry heat, or by brushing or spraying a solvent on the pre-cemented surfaces.

The new product is said to provide an exceptionally strong and permanent bond and to join together or one to the other the following materials: fabrics, leather, glass, synthetic rubber, vinyl copolymer resins, butyral resins, phenolic resins, paper, wood, pliofilm, steel, galvanized iron, coated and finished papers, aluminum, tinfoil, aluminum foil, artificial leather, nitrocellulose, and neolite.

Acid Leavening Agent

New type sodium acid pyro phosphate designed for doughnut machines.

Monsanto Chemical Co. is in commercial production of a new type sodium acid pyro phosphate especially developed as an acid leavening agent for cake-type doughnut flour mixes used in automatic doughnut machines.

The new sodium acid pyro phosphate is claimed to have improved storage life in the mixed flour and a controlled doughnut rate of reaction throughout the baking period.

Exhaustive baking, laboratory and field tests of actual production runs indicate that the new product gives controlled gas evolution which results in machine-made doughnuts that are tender with excellent taste and texture and with greatly reduced grease absorption.

Heat-Transfer Fluids

New synthetic liquids for heat exchange in 60°-500° F. range.

New heat-transfer fluids with unusual resistance to sludging and coking are now being produced commercially by Carbide and Carbon Chemicals Corp. These new synthetic fluids are made from polyalkylene glycols and derivatives and differ chemically and in performance characteristics from petroleum oils, silicones, and the synthetic oils developed by Germany during the war. Experience shows them to be most valuable as heat-transfer liquids in a temperature range from 60° up to 500° F. They are characterized by low pour points and have little change in viscosity with temperature. They have a minimum effect on various types of rubber and packings. Both water-soluble and water-insoluble fluids are available in various viscosities under the registered trade-mark "Ucon."

Asphalt Shingle Paint

Finish paints, weatherproofs asphalt walls and shingles.

"Asphalt-Seal," a waterproof finish for painting and weatherproofing asphalt side wall and roof shingles is now being marketed by its originators Dewatex Manufacturing Corp., 42nd Street and Dyer Ave., New York 18, N. Y.

Developed especially for use to restore and beautify dirty, weatherbeaten insulated brick siding, the manufacturer claims this new product stops bleeding and crumbling, by sealing the pores of the surface, leaving a colorful waterproof finish which will withstand atmospheric and weather conditions.

Available in one and five gallon containers this finish is ready mixed for immediate application and comes in three light and four dark colors.

Veneer Adhesive

New resin adhesive simplifies tapeless splicing of veneers.

A new one-component adhesive said to offer superior performance for tapeless splicing of veneers has been developed by the Resinous Products Division of Rohm & Haas Co. Designated as Uformite JS-508, it is a urea formaldehyde resin adhesive which works equally well on either jointer or splicer applications. Joints are permanent, practically invisible,

ISCO OPERATION News

SEPTEMBER, 1949

Isco Caustic Potash

Produced in the ISCO Plant at Niagara Falls, N. Y.

REGULAR GRADES
For all purposes
FLAKE • SOLID • CRUSHED
BROKEN 90%
Also LIQUID 45-50%
For Soap Makers

SPECIAL QUALITY
Liquid FC 45%
Low in chloride and iron-free
Where extra purity is required

ISCO American Selected WALNUT CAUSTIC POTASH
For the absorption of moisture and
CO_2 in the air liquefaction industry

STOCKS MAINTAINED AT NEW YORK AND OUR BRANCHES

INNIS, SPEIDEN & CO. ISCO
117 LIBERTY ST., NEW YORK 6
BOSTON CHICAGO CLEVELAND CINCINNATI GLOVERSVILLE PHILADELPHIA
SUBSIDIARY E. S. BROWNING CO., INC. SAN FRANCISCO • LOS ANGELES

ARE "JEWELS" HIDDEN in YOUR PROCESS LIQUIDS?

recover them with the selective exchanger . . .

CHECK THESE ADVANTAGES

AMBERLITE IRC-50 is a white, bead-form cation exchange resin whose activity stems from countless carboxylic acid groups. It displays maximum efficiency in the isolation, concentration and purification of compounds that evade capture by ordinary ion exchange.

• • •

The capacity of AMBERLITE IRC-50 far exceeds that of other cation exchangers. And because of its affinity for hydrogen ions, the resin can be regenerated by little more than theoretical quantities of acids.

• • •

For other adsorption operations, Rohm & Haas provides *strong-acid* exchangers —AMBERLITES IR-100, IR-105, IR-120. Write for full information on these exchangers, too.

Amberlite IRC-50

Tiny "gems" lie buried in tons of rubble—elusive molecules so much like their neighbors that they defy crude separation methods. To recover them you need selective AMBERLITE IRC-50—the weak-acid exchanger that chooses and discards ions with speed and *precision*.

AMBERLITE IRC-50 has no sulfonic or phenolic constituents to compete for cations—no strong acids whose avidity for cations causes them to seize the bad with the good. Extremely high capacity and high acid-regeneration efficiency combine to bring economy to your separation processes. And AMBERLITE IRC-50 *can be buffered* to a very wide range of salt-to-free acid ratios, so that adsorption can be performed at controlled pH values—a refinement difficult with strong-acid exchangers.

For *precision and economy* in the recovery of basic and neutral amino acids, alkaloids, vitamins, organic bases, and thousands of other valuable cations, write to Department CI-1 for technical literature or for answers to your specific questions.

AMBERLITE is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.

SAVE PROCESS STEPS

WITH THE AMBERLITES

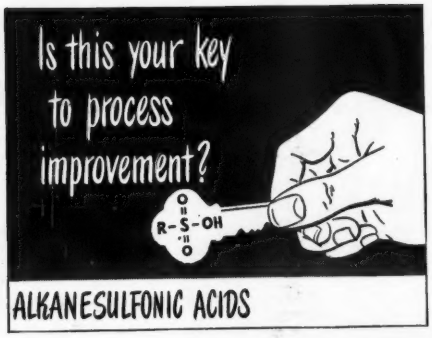
CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

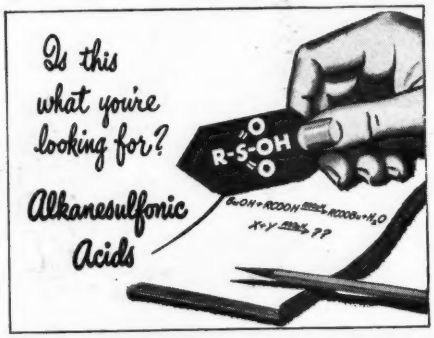
THE RESINOUS PRODUCTS DIVISION

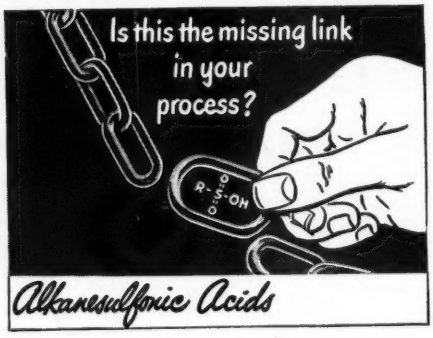
Washington Square Philadelphia 5, Pa.

The Resinous Products Division was formerly The Resinous Products & Chemical Company



Many found the answer to these 1948 ads was "YES"





Have you checked up?

An active non-sulfonating, non-oxidizing catalyst for

ACYLATION
ALKYLATION
CONDENSATION
POLYMERIZATION
ESTERIFICATION

INDOIL CHEMICAL COMPANY
910 SO. MICHIGAN AVE. • CHICAGO 80, ILLINOIS

SEND FOR BULLETIN 11

INDOIL® CHEMICAL PRODUCTS

and highly resistant to moisture and other service hazards. Also, the use of these adhesives eliminates the need for removing tape by soaking and sanding.

JS-508 is supplied as a light tan, dust-free powder containing both catalyst and lubricating agent; protected from moisture, it has a storage life at 75° F. of up to one year. Readily dispersed in water, at 75° F., it affords a pot life of eight to 12 hours, so that a full working day's supply may be prepared at one time.

Nasal Inhaler

Benzedrex, new remedy for head colds, to replace benzedrine inhalers.

A new nasal inhaler called "Benzedrex," which gives relief to sufferers of head colds, hay fever and sinusitis has been introduced by Smith, Kline & French Laboratories. Simultaneous with the introduction of this new inhaler, the Philadelphia firm announced that it would replace Benzedrine inhalers with Benzedrex. The new inhalers are non-stimulating and, unlike Benzedrine inhalers, are not susceptible to improper use.

The discovery of 1-cyclo hexyl-2-methylaminopropane (Benzedrex) culminates an extensive research program which was directed towards finding a chemical compound capable of shrinking the nasal membranes as well or better than Benzedrine, but not stimulating to the user.

Synthetic Finish

Finish for wood or metal dries fast, can be baked.

A new synthetic finishing material, Fastuff, that air dries and sets to a tough, flexible, tack-free film with the speed of a lacquer has been developed by United Lacquer Mfg. Corp., 1001 W. Elizabeth Ave., Linden, N. J.

This same material can be air dried or baked in a few minutes at 250° or 300° F. and is not affected appreciably by over-baking.

Fastuff is available in white, black, and all other colors for wood, metal, as well as aluminum and brass.

Redwood Coating

Special sealer prevents discoloration of redwood.

Monsanto Chemical Co.'s Western Division, Seattle, Wash., has developed a special coating to protect the crimson hue of California redwood. The pigments in Redwood Rez, the new surface coating and sealer, have been selected because of their ability to shield the wood against ultraviolet rays which cause discoloration.

The company's new product, another in its line of primers and finishes, is also an efficient sealer for cedar, pine, fir and other woods as well as redwood. It will

New Fine Chemicals Plant of Tennessee Products and Chemical Corporation, now in operation at Chattanooga, Tennessee.

The Newest in Production of
FINE CHEMICALS FROM COAL

This plant represents the newest in controlled production of fine chemicals of high purity, consistent purity.

Developments and products of our Research Division created the need for this plant. Research found or developed for it the most modern and appropriate equipment and facilities. Research combined the equipment into ultra efficient production units.

With consistent high quality as our goal, expense was not spared in creating this equipment. Almost all of the processes are automatically controlled by the latest instruments. Many of these instruments were specifically designed for our operations. We believe that today this plant creates a new peak in quality in fine chemicals. With Tepco you can be sure of consistent high purity.

● CURRENT PRODUCTION is on USP Sodium Benzoate, flaked or powdered, and on Benzoic Acid, Benzaldehyde, Benzyl Alcohol and Benzyl Benzoate. Other Fine Chemicals are scheduled for delivery at short intervals as the tempo of operations rises.

HELP FOR YOU. You may have questions on the suitability of some Tepco Fine Chemical for a specific use. Our Research and our Technical Sales Division will collaborate in an accurate and prompt reply to your inquiry.

TENNESSEE PRODUCTS & TEPCO CHEMICAL CORPORATION

NASHVILLE, TENNESSEE • Eastern Sales Office: 350 Fifth Avenue, New York 1, N. Y.

59 YEARS OF NH_3 EXPERIENCE

WHEN YOU choose Barrett Standard Anhydrous Ammonia to supply your NH_3 needs, you are using a product which is backed by 59 years of experience.

Barrett Standard Anhydrous Ammonia is America's leading source of NH_3. Its dependable quality, consistent purity and uniform dryness have made it the standard for the chemical industry since 1890.

Barrett Standard Anhydrous Ammonia is available in two grades:

▶ **Refrigeration Grade, guaranteed minimum 99.95% NH_3.**

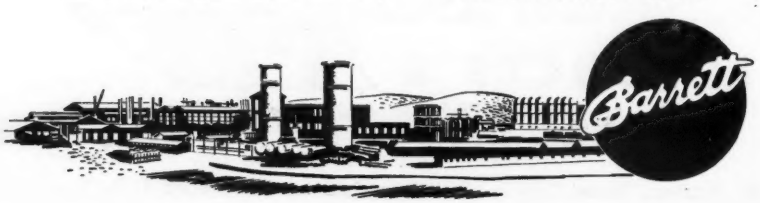
▶ **Commercial Grade, guaranteed minimum 99.5% NH_3.**

Both grades are shipped in tank cars with a capacity of approximately 26 tons of NH_3. Refrigeration Grade only is also packaged in 150, 100 and 50-pound cylinders. Tank car shipments are made from Hopewell, Virginia, and South Point, Ohio. Loaded cylinders are stocked at points conveniently located from coast to coast.

Barrett Standard Anhydrous Ammonia passes rigid tests for moisture, non-condensable gases and other impurities, before release for shipment. Cylinders and tank cars are thoroughly cleaned and inspected, upon return to the plant, before reloading.

The advice and help of Barrett technical service men are available to Barrett customers without charge. Free literature on Barrett Standard Anhydrous Ammonia will be mailed on request.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.



cover from 200 to 350 square feet per gallon, depending on the surface. Redwood Rez is available in quart, gallon and five-gallon sizes in paint, hardware and building material stores.

Luminescent Paste

Chemical luminiscent product offered for marking, identifying articles and making fish lures.

Chemi-Lume Light Paste, manufactured by the Varniton Co., 416 North Varney St., Burbank, Cal., is a water-soluble, synthetic organic preparation containing 3-aminophthalhydrazide as the principle chemiluminescent producing substance. When mixed with 5% sodium hydroxide and 3% hydrogen peroxide a luminous glow, bright enough for several minutes' reading, occurs in the dark. The light produced is visible light plus a small amount of ultraviolet light.

Suggested uses for the paste are for identifying various articles of ships' cargoes, such as hemp, rope, etc.; for marking and identifying small department store articles subject to continuous return; for tracing small streams at night or locating pipe line leaks in industry; as a fish lure for night fishing. It sells for $1.50 to $1.00 a pound, depending on quantity. It comes in blue, green or orchid.

Slot Insulation

Motor insulation features new binder.

A new slot insulation for motor manufacturers has been introduced by the Irvington Varnish & Insulator Co., 6 Argyle Terrace, Irvington, N. J. Known as Irv-O-Slot, the insulation employs a newly-developed binder for bonding the varnished cambric to the paper stock. Unlike common pitch binders, it will not harden with age, nor ooze out under heat. Nor will the laminated insulation migrate or delaminate.

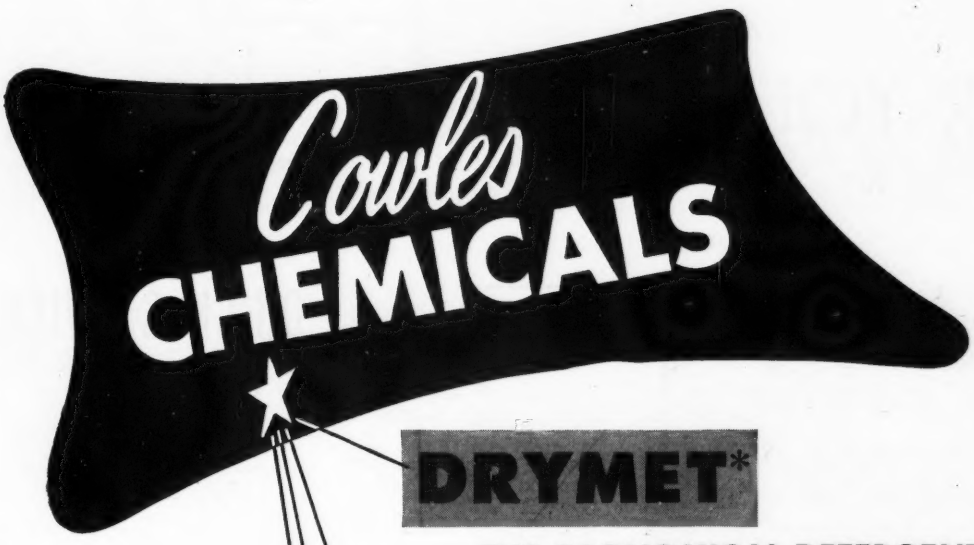
Irv-O-Slot is available with straight-cut or seamless bias varnished cambric bonded to either fish paper or rag stock.

Wood Finishing Lacquer

Quick-drying lacquer developed for wood-working industry.

High gloss, high adhesion, high-speed drying and low cost are the outstanding features claimed for Rez-N-Cote, a synthetic finishing lacquer for the wood-working industry, developed by the industrial products division of Schwartz Chemical Co., Inc., 326 West 70th Street, New York City.

In addition to its moisture impermeability, the new finishing lacquer rates high in the Schopper-Fold test, Sward hardness, checking, toughness and adhesion, according to the manufacturer.



DRYMET*

THE ECONOMICAL DETERGENT SILICATE

Cowles DRYMET, anhydrous sodium metasilicate, is the most highly concentrated form of sodium metasilicate available. It is more economical to use, on the basis of both Na_2O (alkalinity) and SiO_2 (silicate) than any other type of hydrated or anhydrous detergent silicate, either compounded or by itself. DRYMET contains no water of crystallization.

DRYSEQ*

THE ALL-PURPOSE DETERGENT SILICATE

Cowles DRYSEQ, anhydrous sodium sesquisilicate, is a medium pH alkaline cleaner which will do fast, dependable work at a low cost to the user. It is a white, free-flowing powder, quickly and completely soluble in hot or cold water—containing 56.75% Na_2O—making it an economical base material for compounding.

DRYORTH*

THE HEAVY-DUTY DETERGENT SILICATE

Cowles DRYORTH, anhydrous sodium orthosilicate, is a powerful, speedy, heavy-duty cleaner with valuable penetrating and wetting-out properties, reinforced dirt-removing power and unusual emulsifying action. It is an anyhdrous, free-flowing powdered silicate containing not less than 60% Na_2O, which may also be used as an economical constituent of high pH cleaning compounds.

We'll be glad to send you our DRYMET File Folder containing complete technical information and suggested formulations.

CRYSTAMET*

THE MEDIUM pH DETERGENT SILICATE

Cowles CRYSTAMET is a pure, perfectly white, free-flowing granular pentahydrate sodium metasilicate with the normal 42% water of crystallization. Suggested for compounding when it is desirable to lower the concentration of a finished product. Readily soluble—chemically stable—easy to handle. Can be used on medium pH jobs.

PROMPT SHIPMENTS FROM CONVENIENT WAREHOUSE STOCKS....

**Reg. U. S. Pat. Off.*

Cowles Chemical Company

HEAVY CHEMICAL DEPARTMENT • CLEVELAND 3, OHIO

FOR YOUR INFORMATION

PRICES REDUCED AGAIN

FOR SANTICIZER 141
FOR SANTICIZER 160

New lower prices now are in effect for Santicizer*141 and Santicizer 160, two Monsanto Plasticizers that improve products made of vinyls. These primary vinyl plasticizers, used separately or in combination, add numerous desirable qualities to films, sheetings, extrusions, protective coatings and floor tile.

☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆

For quotations and technical information on Santicizer 141 and Santicizer 160, contact the nearest Monsanto Sales Office or mail the coupon.

Advantages of SANTICIZER 141

- Excellent processing action
- Low-temperature flexibility
- Flame resistance
- Light stability, resistance to embrittlement
- Low volatility
- Non-toxicity

Advantages of SANTICIZER 160

- Low cost
- Excellent processing action
- High tensile and tear strength
- Low burning rate
- Oil and abrasion resistance
- Heat and light stability
- Gives finest results of any vinyl plasticizer in its price class

Advantages of 141 and 160 blends

Mixtures yield formulations with:

- Economic advantages
- Excellent processing characteristics
- Good light and heat stability
- Excellent outdoor weathering properties
- Good low-temperature flexibility
- Flame resistance
- Good "hand" and drape

CALCIUM NITRATE CRYSTALS IMPROVED...PRICE REDUCED

Monsanto's Merrimac Division, which has manufactured high-grade crystalline calcium nitrate as a latex coagulant for several years, now is offering an improved product to the rubber industry. This white, finer-size, high-purity crystal dissolves faster and has the low water content so desirable for latex coagulation. The new product is packed in 100-pound, waterproof bags and is available in all quantities at the lowest price since before the war. Convenient, ready-to-use solutions of the crystalline product in specially denatured alcohol also are available.

QUICK SERVICE

Industries often need hurry-up service on heavy chemicals and intermediates. Such service is available at Monsanto. Industries always need uniform high quality in these basic chemicals. The Monsanto trademark is assurance of quality. That's why scores of companies are regular customers for Monsanto heavy chemicals and intermediates. Information and quotations on any of these products will be sent promptly upon request. The following heavy chemicals and intermediates are available:

HEAVY CHEMICALS

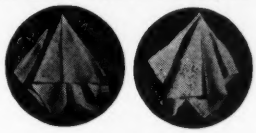
Basic Chrome Sulfate (Santotan*) for tanning industry • Salt Cake (Sodium Sulfate, Technical) • Sodium Sulfite Anhydrous, Technical (Santosite*) • Sulfur Dioxide • Muriatic Acid • Nitric Acid • Sulfuric Acid

INTERMEDIATES

para-Aminobiphenyl • *para*-Nitrobiphenyl • *ortho*-Anisidine • *para*-Anisidine • Benzoic Acid, Technical • Benzyl Chloride • Dichloroaniline • *ortho*-Chloroaniline • *para*-Chloroaniline • *ortho*-Chlorophenol • *para*-Chlorophenol • Cyclohexylamine • Dicyclohexylamine • Dinitroaniline • Dinitrochlorobenzene, 46.50° • Dinitrochlorobenzene, 48.0° • *ortho*-Nitroaniline • *ortho*-Nitrochlorobenzene • *ortho*-Phenetidin • *para*-Phenetidin • Phenolsulfonic Acid • Sodium Benzoate, Technical • *para*-Toluenesulfonamide • *para*-Toluenesulfonchloride • Toluenesulfonic Acid • Chlorosulfonic Acid • *meta*-Chloroaniline • Monsanto Salt • *ortho*-Aminobiphenyl • *ortho*-Nitrobiphenyl • *para*-Nitrochlorobenzene • *para*-Nitrophenol • Phenol • Phosphorus Oxychloride • Phosphorus Trichloride • Salicylic Acid, Technical

News of Monsanto Chemicals for the Process Industries . . . September, 1949

BIOLITE KEEPS RENTAL LINENS FREE OF MILDEW



With BIOLITE Without BIOLITE

These are the advantages of Biolite (a solution of sodium pentachlorophenate): Can be applied in any standard commercial laundry equipment . . . no additional handling or washing operation required . . . eliminates the problem of mildew forming between pick-ups . . . costs only a few cents per hundred pounds of wash . . . no discoloration of fabrics . . . works on all types of fabrics. For more information, ask for folder entitled: "Cut Mildew Loss With Monsanto Biolite."

NEW LITERATURE tells how Santochlor* (Monsanto's *para*-Dichlorobenzene) is used to stop moth attack in clothing, furs, rugs, upholstery. It's profitable reading. For your copy, use the coupon. Ask for: "Santochlor (*para*-Dichlorobenzene) For Clothes Moth Control."

PAS AVAILABLE

Monsanto *para*-Aminosalicylic Acid is available in commercial quantities for continuing experimental work in tuberculosis therapy. Samples will be sent to pharmaceutical manufacturers without cost or obligation.

Monsanto's Sodium Tripolyphosphate has amazing efficiency as a builder or detergent aid in any type of cleaning compounds including those for dairies, metal cleaning and textile processors.

Sodium Tripolyphosphate gives detergency a boost through synergistic action . . . helps in peptizing and emulsifying soil . . . prevents formation of calcium and magnesium deposits caused by hard water and acts as a solvent for such deposits made previously . . . controls alkalinity through buffering action.

Put *extra* qualities into your cleaning compounds with Monsanto Sodium Tripolyphosphate and see how its extra performance brings you extra sales. Further information and quotations will be sent on request. Ask for the new Technical Bulletin No. P-139 which gives full details on Monsanto Sodium Tripolyphosphate.

MONSANTO'S COMPLETE LINE OF PHOSPHATES FOR THE DETERGENT FIELD

PHOSPHORIC ACID
TRI SODIUM PHOSPHATE
MONO SODIUM PHOSPHATE
DI SODIUM PHOSPHATE, ANHYDROUS
TETRA SODIUM PYROPHOSPHATE
SODIUM TRIPOLYPHOSPHATE
SODIUM ACID PYROPHOSPHATE
MONO AMMONIUM PHOSPHATES
TETRA POTASSIUM PYROPHOSPHATE
HEMI SODIUM PHOSPHATE

OTHER MONSANTO PHOSPHATES

Mono Calcium Phosphate
Di Calcium Phosphate
Calcium Pyrophosphate
Tri Calcium Phosphate
Di Ammonium Phosphate
Mono Potassium Phosphate
Di Potassium Phosphate
Tri Potassium Phosphate
Magnesium Phosphates
Aluminum Phosphates
Iron Phosphates
Alkyl Acid Phosphates
Alkyl Alkali Phosphates
Special Phosphates

Address inquiries to:
MONSANTO CHEMICAL COMPANY, Desk J, 1703 South Second Street, St. Louis 4, Missouri, or contact Monsanto Sales Offices in Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

*Reg. U.S. Pat. Off.

There's profit for *you* in synergistic action of SANTOMERSE No. 1 and MONSANTO TSPP

You can profit from the synergistic action of Santomerse* No. 1 and Monsanto Tetra Sodium Pyrophosphate by making more effective cleaning compounds at economical costs. Your better products result in satisfied customers and repeat business. Economical production may enable you to meet competitive prices or enjoy a wider profit margin.

Synergistic Action is the result of the two Monsanto detergents working together to give cleaning power greater than the average of the two used separately . . . greater than either used alone. Tetra sodium pyrophosphate, priced even lower than economical Santomerse No 1, lets you reduce costs while making a more powerful cleaning compound.

When building entirely new products or improving your present line, look into the opportunities offered by the synergistic action of Santomerse No. 1 and Monsanto TSPP. For details, mail the coupon, contact the nearest Monsanto Sales Office or write Monsanto headquarters in St. Louis.

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NEW PRODUCTS & PROCESSES

Maleic Esters

Carbide offers three maleic esters on plant scale for polymers and copolymers.

Three maleic esters—diethyl maleate, dibutyl maleate, and di(2-ethylhexyl) maleate—are now available for immediate shipment from Carbide and Carbon Chemicals Corp. Major interest in maleic esters centers around their use as monomers for polymerization and copolymerization. By adjusting reaction conditions and by choosing monomers judiciously, the polymers that can be produced range from very brittle resins to soft, internally plasticized and readily extensible materials. In general, the lower molecular weight esters yield the more brittle polymers, while esters of high molecular weight alcohols tend to produce soft, flexible materials. The polymers and copolymers of maleic esters have been used in many industrial applications such as coatings, films, molded products, and textile specialties. According to Carbide, other maleic esters such as dimethyl, diisopropyl, dihexyl, and diallyl maleates can also be produced upon reasonable notice.

Address: 30 East 42nd St.
New York 17, N. Y.

Chloropropionitrile

American Cyanamid makes nitrile derivative available in trial-lot quantities.

β-Chloropropionitrile is now being offered by American Cyanamid Co. in trial-lot quantities. The reactivity of this material, due to an active halogen and a nitrile group, causes it to result in numerous potentially useful chemicals. It is slightly soluble in water, very soluble in most organic solvents, and has a boiling point of 174-176° C. at 752 mm. Hg.

A bulletin is available which gives extensive data on this chemical. Research samples can also be obtained.

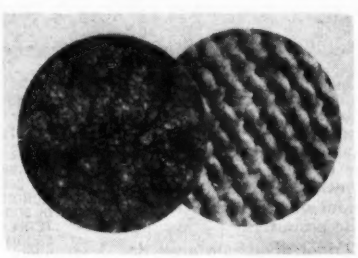
Address: New Product Development Dept.
30 Rockefeller Plaza
New York.20, N. Y.

Phenolic Laminate

Long-fiber cotton mat filler adds high impact fatigue values to phenolic laminates.

Synthane Corporation is in production of a new phenolic laminate material with exceptionally high impact fatigue values and superior machinability. These properties, which are obtained without sacrifice in electrical or chemical values, stem from the use of a cotton mat filler whose random fibers lie in all directions rather than in parallel planes as in the case of woven fabrics.

Even distribution of the matted, unwoven cotton fibers give the new Grade LRF uniform strength in all directions. As a result, parts made from this material wear much more evenly than those fabricated from the conventional woven-fabric-filler plastic laminates. The new mat material is made from a filler having



long-fiber virgin cotton, and should not be confused with mat materials made with linters.

Average values for tensile, flexural and compressive strength of the new Synthane Grade LRF considerably exceed the NEMA averages for Grade L and Grade C. It is in flatwise impact fatigue values, however, that Grade LRF demonstrates its greatest superiority. Tests conducted by Synthane Corporation, consisting of dropping a one-pound weight from a height of one foot at a rate of 40 blows per minute on a notched impact specimen, showed that Grade LRF resisted 5,000 blows, as against 50 blows for Grade L and 100 blows for Grade C. Another characteristic of Grade LRF is its ability to be machined to finish to a very smooth surface. Because of its combination of properties, Grade LRF suggests itself for use in gears, cams, bearings, spools, bobbin heads and punched parts where Grades C and L are now used. The new material also is expected to replace many combination materials which use fabric laminations for mechanical strength and paper for smooth surfaces.

Address: Oaks, Penn.

Surface-Active Agent

Dearborn introduces naphthene-base polyamine for surface-active applications.

Dearborn Chemical Co. has announced a new surface-active agent, tetra-naphthenoyl triethylene tetramine, which has wide commercial possibilities as a modifier, plasticizer or additive. It is an acrylation product of triethylene tetramine with naphthenic acid, a very high viscosity oil, dark in color, insoluble in water but soluble in a variety of organic solvents. It has an acid number of approximately 30.

Suggested uses of this new modifier are as a conditioning agent in the manufacture of textiles, as an additive in pulp and paper manufacture, as a flotation agent in minerals separation, as an oil demulsification agent and insecticide additive. It is commercially available in technical grade. Samples are available.

Address: 310 S. Michigan Ave.
Chicago, Ill.

Low-Cost Vegetable Sterols

Tonnage quantities of phytosterols from soybeans made available by Distillation Products.

Purified vegetable sterols in tonnage quantities are now available for the first time from Distillation Products, Inc.

Refined from soybean oil, the sterols are fine white crystals with a minimum purity of 95 per cent. They are soluble in acetone (2 gm/100 cc), ethanol (2 gm/100 cc), and ethyl ether (10 gm/100 cc). They melt at 135°-138° C. and have a bromine number of approximately 500 gm/kilo.

In the past, the high cost of animal sterols has discouraged much research into commercial processes which would utilize the reported ability of sterols to stabilize oil-in-water and water-in-oil emulsions and to serve as raw material for the synthesis of surface active agents, pharmaceuticals, and other chemical products. Inexpensive vegetable sterols are expected to stimulate further research in these fields. Samples may be obtained without charge.

Address: 755 Ridge Rd.
Rochester, N. Y.

Chloroether

Wyandotte introduces a mixture of dichloroethyl and -propyl ethers.

As the latest addition to its line of organic chemicals, Wyandotte Chemicals Corp. announces the commercial availability of Betachlor, a product consisting of β,β'-dichloroethyl ether (approx. 57%) and β,β'-dichloroisopropyl ether (approx. 43%).

Because of its excellent solvency for oils, fats, waxes and greases, Betachlor is expected to assume an important role in extraction processes, textile processing, and in the formulation of many types of cleaning compounds. Advantages aiding in the use and recovery of this product include a boiling range of 160° C.

3 important additions

SODA ASH
CHLORINE
CAUSTIC SODA

PARA-DICHLOROBENZENE
All standard mesh sizes
Packed in 25, 50, 100 and 200 lb. fiber drums

ORTHO-DICHLOROBENZENE
55 gallon drums
8,000 gallon tank cars

MONO-CHLOROBENZENE
55 gallon drums
8,000 gallon tank cars

SODIUM BICARBONATE
CALCIUM CHLORIDE
CAUSTIC ASH
MODIFIED SODAS
MURIATIC ACID
SODA BRIQUETTES (*Iron Desulphurizer*)
PHOSFLAKE (*Bottle Washer*)
HI-SIL (*Hydrated Silicate*)
SILENE EF (*Hydrated Calcium Silicate*)
CALCENE T (*Precipitated Calcium Carbonate*)
PITTCHLOR (*High Test Calcium Hypochlorite*)
PITTCIDE (*Special Calcium Hypochlorite*)
BORAX
PACIFIC CRYSTALS (*Sodium Sesquicarbonate*)

These three chlorinated benzenes are the newest products manufactured by Columbia . . . a natural development from the position of Columbia and its affiliate as the nation's largest merchant producers of liquid chlorine. Your requirements for alkalies or related specialties, as listed above, can be met promptly and, in many cases, with other definite advantages to your business. Get the facts by contacting any district office, or Pittsburgh Plate Glass Company, Columbia Chemical Division, Fifth at Bellefield, Pittsburgh 13, Pa.

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Everyone has problems

"I'll bet that's Jones, he's always kidding."

VICTOR CHEMICAL WORKS

If yours happens to be dispersion . . . Investigate VICTOR POLYPHOSPHATES

Victor sodium tripolyphosphate and tetrasodium pyrophosphate are powerful dispersants. They offer advantages in that they completely disperse negatively charged substances and hold them in suspension. This unique peptizing action is of special value in cases where the negatively charged material is of gummy, adhesive, or viscous nature. Victor polyphosphates are also advantageously used in coagulating and precipitating positive colloids. So, if you have a dispersion problem, investigate Victor polyphosphates first. Write or fill in and return the coupon for technical bulletin or experimental samples.

VICTOR CHEMICAL WORKS • 141 West Jackson Boulevard, Chicago 4, Illinois

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- ☐ Send technical bulletin on Victor polyphosphates.
- ☐ Sample of Victor sodium tripolyphosphate.
- ☐ Sample of Victor tetrasodium pyrophosphate.

Name_____ Title_____

Company_____

Street_____

V2 City_____ Zone____ State_____

to 183° C., water insolubility, and a flash point of 190° F.

Other important uses for Wyandotte Betachlor are seen in the coatings and resin fields, where this product has already proved to be an effective solvent for many resins and film formers, in addition to functioning as an intermediate in the syntheses of certain resins.

Efficient control of some types of insect infestation, particularly by methods of soil fumigation, is also accomplished by the use of Betachlor.

Address: 1609 Biddle St.
Wyandotte, Mich.

Acid Treatment for Porcelain Enamels

Bureau of Standards shows effects of acid pretreatment on acid and abrasion resistance.

Tests made by the National Bureau of Standards indicate that porcelain enamels pretreated with acetic acid or butyric acid are partially protected from attack when subsequently exposed to citric acid. This effect is explained by the hypothesis that the acetic acid preferentially leaches alkalies from the enamel surface, leaving behind a silica-rich film.

Address: U. S. Dept. of Commerce
Washington 25, D. C.

Flavor Evaluation

New diagramming method describes complex foodstuff flavors, aids improvement.

A method by which flavors and aromas can be both evaluated objectively and portrayed pictorially has been described by Dr. S. E. Cairncross and Mr. L. B. Sjöström of Arthur D. Little, Inc. The new technique is called "flavor profiles". When a food is analyzed by this method, a panel of trained tasters determines which "flavor notes" can be identified individually as standing out from the over-all flavor blend, how strong these notes are, and also how strong the basic blend of flavor is. With this information, a diagram can be drawn in which a semicircle represents the strength of the base flavor and distinctive bars radiating from the center represent each of the notes which stand out above the base flavor. The size of the semicircle and the length of the bars identify the flavor just as a police description identifies a man.

The same information can be used in tabular form, as on a rating sheet, but the diagram of the flavor profile has been found to be an especially clear method of describing a flavor or comparing two different flavors visually.

With the flavor profile, tasting panels can do more than just say whether they like a flavor or not, Cairncross and Sjörtröm report. They can write down the kinds of flavors and odors they find and they can determine how a change in cooking pro-

"That 100-foot pipe run is shot again, chief... the darn thing corrodes through every six months!"
PLANT MANAGER
"Let's try 'KARBATE' pipe this time"

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1. Resists the action of acids, alkalis and other chemicals
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4. Immune to thermal shock
5. Easy to machine and install
6. Full range of sizes and fittings immediately available

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Foreign Department: New York, U. S. A.

These products sold in Canada by Canadian National Carbon Co., Ltd., Toronto 4, Canada

Half a Century of Leadership in

Coal Tar Research and Development

• For nearly fifty years the organization embracing the Reilly Tar & Chemical Corporation has continuously increased the scope of its activities in the coal tar field. All of the regular coal tar chemicals of importance to industry have long been produced by Reilly. As a result of the continued program of expansion in research and development facilities many new materials have been made available to industry, and today Reilly offers a diversity of coal tar products not equalled by any other producer.

Listed here are a few of the high purity, refined coal tar acids, hydrocarbons and bases that are available through the twenty-four Reilly sales offices, located in the principal industrial cities.

ACIDS: m-Cresol, o-Cresol, p-Cresol, m-Ethylphenol, 1,3,5-Methylethylphenol, Phenol, 1,2,4-Xylenol, 1,3,4-Xylenol, 1,3,5-Xylenol, 1,4,2-Xylenol.

HYDROCARBONS: Acenaphthene, Anthracene, Chrysene, Dimethylnaphthalenes, Fluoranthene, Fluorene, Methylnaphthalenes, 1-Methylnaphthalene, 2-Methylnaphthalene, Naphthalene, Phenanthrene, Pyrene, Diphenylene Oxide.

BASES: 2-Aminopyridine, 2-Amylpyridine, 2-Amino-3-Methylpyridine, 2-Amino-4-Methylpyridine, 2-Amino-5-Methylpyridine, 2-Amino-6-Methylpyridine, 2,6-Diaminopyridine, 4-Amylpyridine, 2-Dipyridylethyl Sulfide, 2-Ethanolpyridine, N-Ethylcarbazole, 2-Hexylpyridines, Isoquinoline, Lepidine, 2,6-Lutidine, 3-Methylisoquinoline, 2-(5-Nonyl) Pyridine, 4-(5-Nonyl) Pyridine, Alpha Picoline, Beta Picoline, Gamma Picoline, 2-Mercaptoethylpyridine, 2-Propanolpyridine, Pyridine, Quinaldine, Quinoline, 2-Vinylpyridine, Carbazole.

Information on any of these materials, or any other coal tar products, will be gladly furnished on request.

REILLY TAR & CHEMICAL CORPORATION
MERCHANTS BANK BUILDING, INDIANAPOLIS 4, INDIANA
500 Fifth Ave., New York 18 • 2513 S. Damen Ave., Chicago 8

cedure or a change in ingredients affects the flavor of a food.

In one medicinal product, for instance, the Arthur D. Little, Inc., laboratories found two undesirable notes, a rubbery one and a sour-yeasty one. Flavor profiles showed that some materials added to the product suppressed one note, some the other, and some covered both. With the profiles, each small improvement in the flavor could be noted, so that progress was made rapidly.

Address: 30 Memorial Dr.
Cambridge, Mass.

Basic Chloride of Aluminum

Basic aluminum chloride added to Reheis line.

Reheis Co., Inc., announces the addition to its regular line of chlorhydrol, $(Al_2(OH)_5Cl)_x$, a basic aluminum chloride with a pH range of from 3.9 to 4.6.

Chlorhydrol has a high aluminum content and dissolves freely in water to give a stable solution. The new aluminum chlorhydroxide complex is a fine granulation, having an apparent density of 0.94, approximately that of water. It has the following characteristics:

Al content (as Al_2O_3)	$\geq$ 46%
Cl content	$\geq$ 15%
Sulphates	$<$ 0.05%
Heavy metals	$<$ 30 p.p.m.
Arsenic	$<$ 2 p.p.m.
Iron as Fe	$<$ 0.1%

Address: Snyder Ave.
Berkley Heights, N. J.

Processing

Milling cold rubber with an aromatic mercaptan gives a more workable product.

A new and improved process which greatly facilitates the fabrication of low-temperature GR-S synthetic rubber has been developed by E. I. du Pont de Nemours & Co. This new process involves milling the product at a temperature below 350° F. in the presence of about 0.5 per cent of an aromatic mercaptan—an amount considerably greater than is needed to soften other synthetic elastomers or natural rubber.

Factory processing of "cold" rubber has not been easy. Before tires or other articles can be fabricated from rubber, the elastomer must be softened by masticating, and low-temperature GR-S is extremely hard to break down. The difficulties encountered in softening "cold" GR-S were so great as to constitute a formidable bar to the general use of this admittedly superior synthetic.

Difficulties in the processing of low-temperature GR-S led to a systematic investigation in Du Pont's Rubber Laboratory of the mastication of this rubber in the presenece of various chemical softeners and under various milling condi-

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PENTAERYTHRITOL (TECHNICAL GRADE)

FOR SURFACE COATINGS OF BETTER HARDNESS, SUPERIOR GLOSS AND COLOR RETENTION, MORE RESISTANCE TO WATER AND ALKALI

PROPERTIES

Formula	$C(CH_2OH)_4$
Composition	approximately 90% pentaerythritol, and 10% dipentaerythritol
Appearance	white powder
Melting Range	185°-230°C.
Hydroxyl Content	47.5%
Combining Weight	35.8
Water	0.3%
Ash	0.06%
Specific Gravity 25°/4°C.	1.38
Bulk Density	0.7 (44 lbs./cu.ft.)

Solubility (g. per 100 g. solvent)	
Water at 25°C.	8
Water at 100°C.	90
Ethanol at 25°C.	0.5
Benzene at 25°C.	insoluble
Acetone at 25°C.	insoluble
Oils at 25°C.	insoluble
Glycerol at 100°C.	approx. 10
Pyridine at 100°C.	approx. 5

General

Non-hygroscopic; non-toxic; all hydroxyl groups esterifiable

PENTEK is available in 80-lb. multiwall bags. Fully detailed illustrated booklet on Pentek will be mailed promptly upon request on company letterhead.

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(Dipentaerythritol, Tech.)

TRIPENTEK®
(Tripentaerythritol, Tech.)

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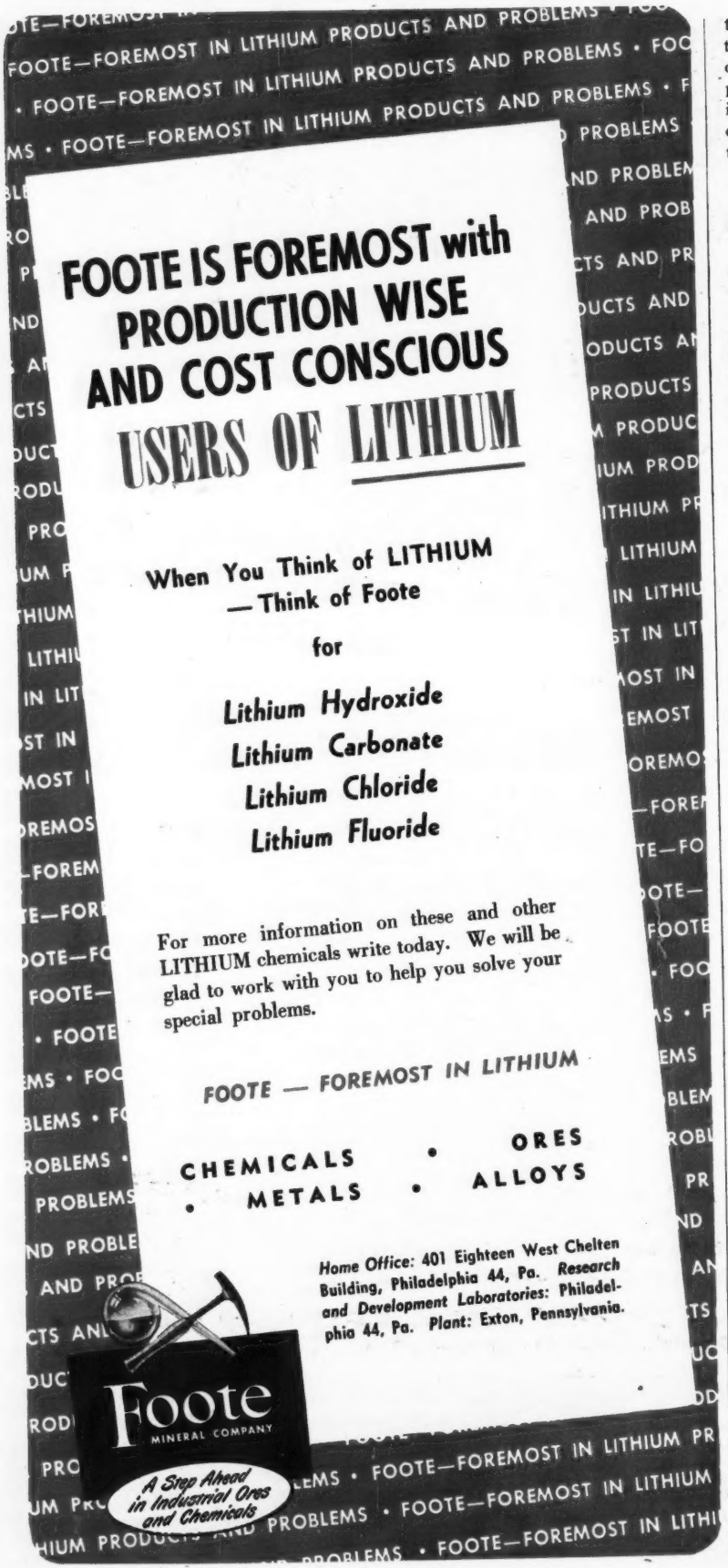
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tions. Results of this study indicated that the best results are obtained when about one-half part of an aromatic mercaptan per 100 parts of low-temperature GR-S is used as softener, and when milling is carried out for a short time at a temperature below 350° F.

Address: Wilmington, Del.

Biochemical

Desoxyribonucleic acid, fundamental biochemical in life processes, now available for investigation.

Desoxyribonucleic acid has been added to the Schwarz Laboratories, Inc., list of fine chemicals that play important roles in the life processes. Originally called thymus nucleic acid because the "sweetbreads" or thymus glands of calves were the usual source, desoxyribonucleic acid, or DNA, is now known to occur in the genes of all cell nucleic.

Address: 202 East 44 St.
New York 17, N. Y.

Polythene Coatings

Coatings of polythene are now made possible by DuPont resin.

Du Pont is now producing commercial quantities of a new series of polythene resins for use as coating materials. They have been given the trade-mark "Alathon."

While they hold promise for use in a variety of industries, their development to date has been confined largely to their use as coatings by paper manufacturers and converters.

The "Alathon" polythene resins are closely related to the Du Pont plastic, polythene. They are highly resistant to chemicals. They have excellent electrical insulating properties at high as well as low frequencies. They are tasteless, odorless, and non-toxic. They are not only waterproof, but have a very low rate of vapor permeability.

Their outstanding physical characteristic is their lightness. In appearance, they are white, waxy, and translucent. Mechanically they range from hard, brittle, wax-like materials to tough, flexible compositions.

The resins give papers a brilliance approaching that of a lacquer finish. The new coatings also are harder, somewhat tougher, and non-sticky. In addition, their grease resistance is considerably improved and their heat-seal strengths are made slightly better.

Papers coated with "Alathon" can be used to particular advantage as packaging for materials that are acid or corrosive in nature; or that contain animal or vegetable fats and oils; or that must be protected from moisture; or kept from drying out; or kept at a high degree of chemical purity.

Because the flexible types of "Alathon" polythene resins retain flexibility at subzero temperatures, papers coated with

NOTES FROM THE ... NUCHAR

purification notebook

Sodium Glutamate from Beet Sugar Waste

Beet sugar wastes have been found to contain glutamates in quantities sufficient to justify recovery. Following separation and concentration of the glutamates, crystals of glutamic acid—hydrochloride are formed. These crystals are redissolved in a small amount of water and treated with from 3 to 6% Nuchar Activated Carbon. Following filtration, the solution is concentrated and again crystallized, after which the glutamic acid is converted to sodium glutamate by caustic soda treatment.

In some cases, it is desirable to apply Nuchar Activated Carbon in stages. When this procedure is employed, Nuchar is also applied during the conversion of glutamic acid to sodium glutamate.

Write today for a list of industrial applications in which Nuchar can be used advantageously to reclaim valuable materials by removal of impurities.

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division west virginia pulp paper company

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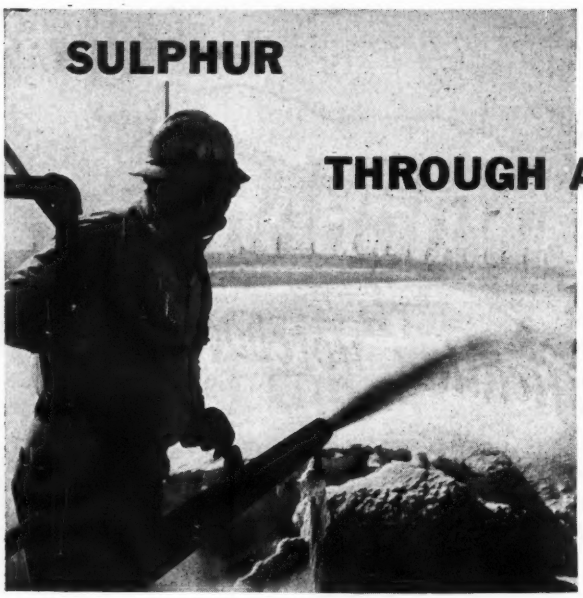
SULFATE WOOD TURPENTINE ● ALPHA PINENE ● BETA PINENE ● POLYCEL CELLULOSE FIBERS

INDULIN (LIGNIN)



Molten Sulphur is sprayed into a storage vat at the Grande Ecaille property of Freeport Sulphur Company in Louisiana.

One of a series of Stories of Sulphur

SULPHUR is mined through a pipe. On the Gulf Coast Sulphur is mined not as solid but as liquid; not by pick and shovel but by superheated water. Sulphur men use water and pipes and air pressure for tools and learn from instruments about the deposits they never see.

HEATED under pressure to 320 degrees Fahrenheit, the water is piped down hundreds of feet to melt the Sulphur in its underground deposit. Molten streams of yellow mineral are forced to the surface, and still glowing are poured into the storage vat to cool and harden.

THOUSANDS of feet of pipe carry the compressed air, water and molten Sulphur and millions of gallons of water are used in the process. Great power plants keep pumps, compressors and boilers operating and sensitive instruments record temperature and pressure.

FREEPORT SULPHUR COMPANY

OFFICES: 122 East 42nd Street, New York 17, N. Y.

MINES: Port Sulphur, Louisiana • Freeport, Texas

SULPHUR SERVES INDUSTRY

them offer obvious advantages as frozen food packages, or for the protection of machinery and equipment at low temperatures. At the other extreme, "Alathon" coated papers, because of their resistance to moisture, will protect electrical apparatus and other equipment against corrosion and fungi during storage under hot, humid conditions.

Du Pont is producing commercially four "Alathon" resins—A, B, C, and D. Their molecular weights range from 18-19,000 for "Alathon" A to 8-9000 for "Alathon" D. All of the resins may be applied by commercial methods.

Address: Wilmington, Del.

Polyblend Powder

Vinyl resin-nitrile rubber blend now manufactured as powder.

The commercial manufacture of a new Geon Polyblend in dry powder form is announced by B. F. Goodrich Chemical Co. Designated as Geon Polyblend 500 X 479, it is a colloidal blend of vinyl resin and Hycar nitrile rubber which has been found extremely suitable for either mill or Banbury mixing operations, according to the company.

The powdered Polyblend can be stabilized with standard vinyl stabilizers and lubricants and fluxed either on a hot mill or in a Banbury. The material can be calendered at 6-8 mils thickness with a roll temperature around 275° F.

One calendered film application for the new Geon polyblend recently disclosed is a replacement for polyethylene sheeting and Holland cloth as liner material for handling raw rubber stocks in factory processing. The use of polyblend film for such an application offers production economies because it can be recalendered over and over instead of being discarded.

Address: Rose Building
Cleveland 15, Ohio

Dimer Acids

Emery is now producing dimerized fatty acids—applicable for many purposes—on a commercial scale.

Commercial availability of dimer acids has been annonuced by Emery Industries, Inc.

These dimer acids are liquid dibasic acids, quite viscous in nature, with a molecular weight of approximately 560. The dimer itself can be represented in the simplest case as two molecules of linoleic acid combined through the Diels-Alder reaction to form a "cyclic" compound involving the double bonds of the polyunsaturated fatty acids. Therefore, physically, and in reactions, the behavior of the dimer is typical of a C_{36} dibasic acid.

Since the formation of dimers is probably the first step in the "sub-surface" drying or polymerization of an oil, the

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Barrett

we are now designating our Quality Line of Plasticizers as

"ELASTEX" PLASTICIZERS

BARRETT "ELASTEX" DCHP PLASTICIZER (Dicyclohexyl Phthalate)	
Color	White
Form	Granules
Odor	Moderate aromatic
Acidity (as Phthalic Acid), %	0.10 Maximum
Saponification Number	335-345
Melting Point, °C.	62-65
Containers	Fibre drums containing approximately 230 pounds net.
BARRETT "ELASTEX" 10-P PLASTICIZER (Diisooctyl Phthalate)	
Color	Clear, 100 Hazen Maximum
Form	Liquid
Odor	Characteristic
Acidity (as Phthalic Acid), %	0.01 Maximum
Specific Gravity, 20/20° C.	0.984±0.005
Saponification Number	280-290
Cloud test for water	Clear at 0° C.
Containers	50-55 gal. non-returnable steel barrels.
BARRETT "ELASTEX" 50-B PLASTICIZER	
Color	Clear, practically water-white (50 Hazen maximum)
Form	Liquid
Odor	Mild Ester
Distillation at 5 mm. Hg, °C.	189-222
Specific Gravity, 25/25°C.	1.076
Pounds per Gallon at 25°C.	8.95
Refractive Index at 20°C.	1.5071
Viscosity, Centipoises	467 at 5°C., 87.0 at 25°C., 22.8 at 50°C.
Containers	50-55 gal. non-returnable steel barrels.

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Phenol
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*Reg. U.S. Pat. Off.

WE'VE DONE IT FOR ADHESIVE MANUFACTURERS

THERE was a time when adhesives, such as mucilage, paste and glue, had anything to recommend them but a pleasant odor. But not today. Refinement of raw materials, improved processing *and* the ingenuity of technical perfumers have wrought a change. Now these adhesives —or most of them—have either no odor, or if any, it is one agreeable to the human nose. By extension of this odor-masking principle, improvement in gummed tapes, laminated and other glue-impregnated products has also been achieved. . . . Now, the question is: Have *you* such a problem to solve?

PERHAPS WE CAN DO IT FOR YOU!

In the course of your manufacturing or processing operations there may arise certain odor conditions detrimental to the efficiency or comfort of your employees . . . or your finished product may retain some residual odor that acts as a deterrent to sales. In either case we may be able to help you remove or lessen the cause. We'll try if you will write us fully . . . in confidence, of course . . . and with no obligation on your part.

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Est. 1871

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BRANCH OFFICES *and* *STOCKS: *Atlanta, Ga., *Boston, Mass., *Chicago, Ill., Cincinnati, O., Cleveland, O., Dallas, Tex., Detroit, Mich., *Los Angeles, Calif., Philadelphia, Pa., San Francisco, Calif., *St. Louis, Mo., *Toronto, Canada and *Mexico, D. F.
FACTORY: *Clifton, N. J.*

value of adding dimers to a drying oil as a modifying and bodying agent is rather obvious. Dimers are gaining as a replacement for linseed and tung oils—particularly tung oil in the manufacture of varnishes.

With polyhydric alcohols, dimers react like other dibasic acids to form polymers. The dimers impart enough toughness and flexibility so that alkyd-base films prepared from dimers alone behave like bodied oils.

In common with other dibasic acids, dimers form plasticizing agents. Both the polyamides and the polyesters prepared from dimer acids have interesting and unique properties.

When an alkylolamine is condensed with the dimer, the resulting esteramine is a very sticky, almost rubber-like liquid with many interesting properties, some of which indicate a potential use in adhesives.

Address: 4300 Carew Tower
Cincinnati 2, Ohio

Krypton, Xenon

Linde reduces cost by large-scale separation of rare gases from air.

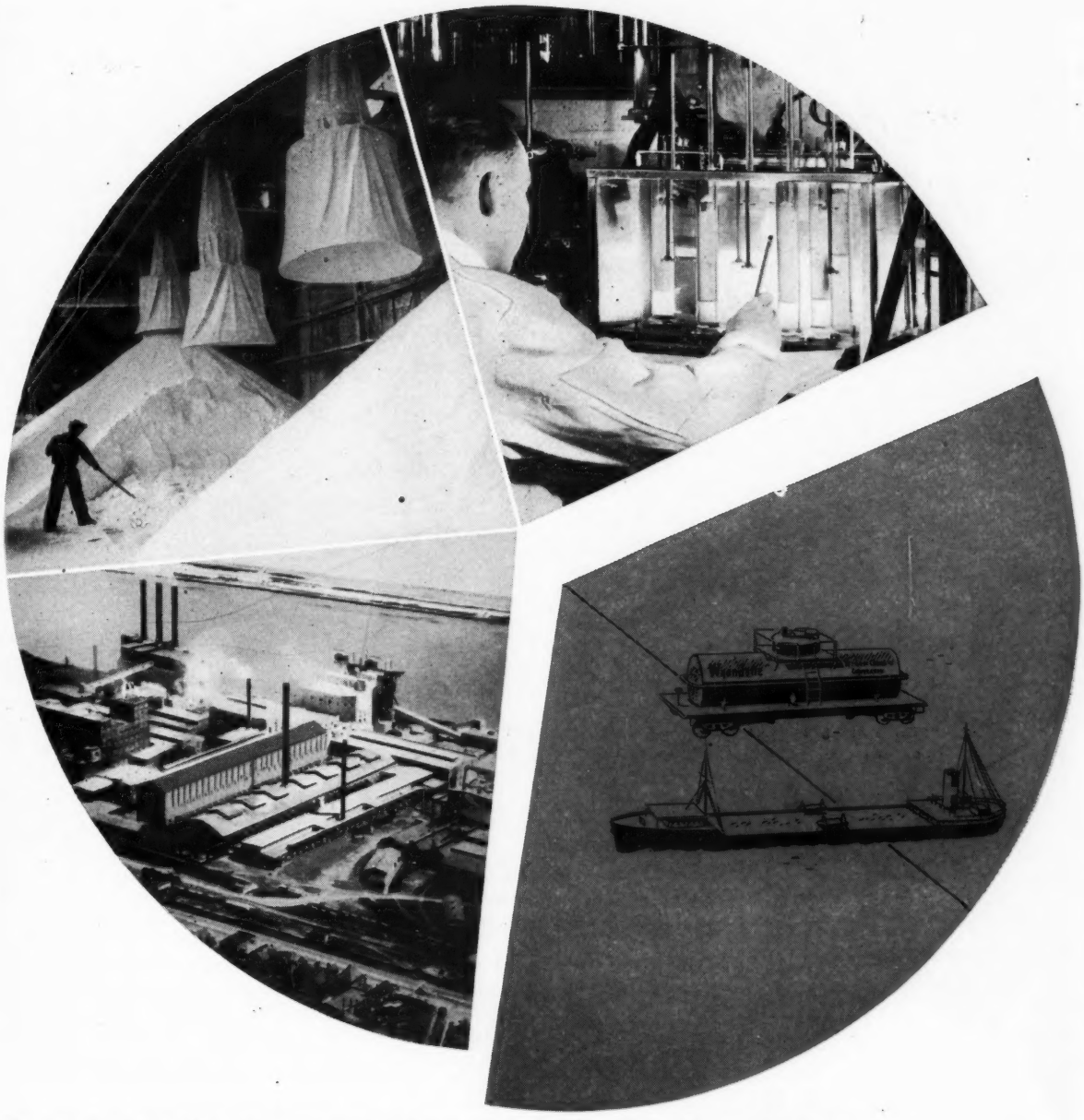
Many diversified products and processes may be improved by using the rare gases krypton and xenon, now that these gases are being made available in commercial quantities and at radically reduced prices. Until now, their widespread use has been discouraged by their relatively high cost. Krypton occurs in the atmosphere one part in one million, xenon one part in twelve million, and their separation and purification have presented complicated problems. But now Linde Air Products Co. is producing krypton and xenon on a large-scale basis and at greatly reduced prices.

Krypton, xenon, and the other rare gases are inert and will not combine with other elements under any conditions. This makes them superior to nitrogen for certain purposes, since nitrogen, although considered inert, will combine with many elements at elevated temperatures.

Krypton and xenon have the advantages of lower thermal conductivity, lower electrical resistance, and lower ionizing potentials than argon. They have other unique characteristics which make them peculiarly suited to certain uses.

Krypton has been used recently to fill fluorescent lamps, miner's cap lamps and other miniature lamps, and krypton or xenon might be used instead of argon for incandescent lamps. Argon is now used in ionization chambers for tracking cosmic rays, an application where krypton and xenon hold promise of being superior. Geiger-Muller counters for detecting and measuring radioactivity use argon, krypton, and xenon.

Xenon has replaced mercury vapor in certain thyratrons and vacuum tubes. Unlike mercury, xenon will not condense at low atmospheric temperatures, and has



Economical transportation completes the picture

As a user of basic chemicals, it will pay you to consider these facts:

Wyandotte is located at the heart of the Great Lakes waterways. Company-owned sources of raw materials — coal, limestone and salt — are close at hand. Recently expanded plant facilities, plus diligent research and 59 years' experience in the field, all assure you of a steady, dependable supply of chemicals — today and tomorrow.

Because of its location, Wyandotte can ship to you either by rail or by water. This company is in a unique position to send caustic soda, soda ash and other chemicals via *both* these forms of transportation.

Wyandotte will be glad to consult with you on your requirements. For *complete* service in chemicals, get in touch with your nearest Wyandotte Representative.

Wyandotte Chemicals Corporation

Wyandotte, Mich. • Offices in Principal Cities

SODA ASH • CAUSTIC SODA
BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE
CHLORINE • HYDROGEN • DRY ICE
GLYCOLS • SYNTHETIC DETERGENTS
CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE
PROPYLENE DICHLORIDE
AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

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NEWARK A.S.T.M. Testing Sieves

NEWARK for ACCURACY

- **NO CREVICES** between cloth and frame to catch and thus "lose" particles.
- **EXACT OPENINGS.** Newark Standard Testing Sieves are made to conform to the latest specifications of the National Bureau of Standards.
- **CLOTH STRONG and DURABLE.** We weave the metal cloth in our own plant, thereby controlling its quality.
- **RE-COVERING SERVICE.** When the wire cloth is worn out return the sieves for re-covering. Often there is a saving.

Our new four page folder gives complete details and specifications. May we send you a copy?

Newark Wire Cloth COMPANY

345 VERONA AVENUE • NEWARK 4, N. J.

electrical properties similar to mercury vapor. Xenon is being used in photographic "speed lamps" of the gas discharge type, and for other specialized uses.

Refined krypton and xenon are available in glass flasks, and in steel cylinders for larger users. Purity standards are high.

Address: 30 East 42 St.
New York 17, N. Y.

Titanium Dioxide Pigments

Improved anatase and rutile TiO_2 pigments now offered by Calco.

Several improved types of titanium dioxide are now being manufactured by the American Cyanamid Co., Calco Chemical Division.

Unitane 0-310 (anatase type) is particularly suited for high-temperature baking enamels, refrigerator finishes, lacquers and phenolic resin enamels. It is recommended also for use where the extraordinarily high hiding of rutile is not required and where the clear bluish tone of anatase is preferred for its decorative effect. It is characterized by low reactivity with most vehicles and produces finishes of excellent gloss and gloss retention.

Unitane OR-342 is a new type of rutile titanium dioxide developed especially for use in enamel finishes and related products. It is particularly adapted to formulas including more reactive vehicles such as the maleic-modified types and certain highly bodied oleoresinous varnishes.

Unitane OR-342 performs especially well in metal decorative roller coatings and in alkyd baking enamels.

Samples of both Unitane O-310 and Unitane OR-342 are available for testing purposes upon request to the Calco Chemical Div.

Address: Bound Brook, N. J.

Fast Greenish-Blue Ink Pigment

New "Monastral" printing ink pigment characterized by fastness to light.

Production of a light-fast blue pigment for printing inks has been announced by the Du Pont Co. It is a green-shade "Monastral" blue pigment.

This is the brightest of all the "Monastral" blue pigments and it has the same light-fastness and resistance to chemicals that the others of this family of pigments have shown. The price is the same as for regular "Monastral" blue and the cost of producing printing ink with it is almost as low as it is with colors which fade.

Falling in the peacock-blue range, the pigment meets a long-standing need for a blue of this brilliance which does not fade.

Address: Wilmington, Del.

Love, of course, is as old as old can be. The *young* idea we call your attention to is that sleek material their rainwear is made of, vinyl plastic. Modern chemists developed it just ten years ago.

Thousands of things are now made of vinyl plastic, one of the most versatile new materials man has created. You find it in upholstery, floor covering, recordings, piping, shoe soles, shower curtains, textiles, wall tile—all of them notable for durability, washability and beauty. All stainproof, rotproof, nonflammable, water repellent.

Tons of DIAMOND ALKALI Chlorine are used by the producers of vinyl plastic. Other DIAMOND chemicals add special qualities: Chlorowax 40, for moldability; Chlorowax 70, a fire retardant; Precipitated Calcium Carbonate, a filler; Chromate, a pigment. The growth of plastics is rooting these *Chemicals You Live By*, especially chlorine, deep in your daily life.

THIS ADVERTISEMENT is one of a series appearing in Time and Newsweek to broaden public understanding of the part DIAMOND ALKALI chemicals play in everyday life. We welcome your inquiry regarding chlorine and other chemicals produced for the plastics industry.

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Chemicals you live by DIAMOND ALKALI COMPANY... CLEVELAND 14, OHIO

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NOTICE TO CUSTOMERS

Although Arapahoe sustained a small fire last month we are back in full production and ready to supply your needs for special organics and custom manufacturing just as efficiently and promptly as always. Please let us have your orders now!

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2800 PEARL STREET • BOULDER, COLORADO
PRODUCERS OF FINE ORGANIC CHEMICALS

Alkyd Resin

Rohm & Haas develops new phthalic oxidizing-type alkyd for enamel formulations.

A new low-viscosity oxidizing-type resin to supply easy brushing, extremely fast drying, good color and good gloss for trade-sales enamels and similar coatings has been developed by the Resinous Products Division of Rohm & Haas Co.

The phthalic alkyd resin, identified as Duraplex C-57, was designed specifically as an outstanding vehicle for production of improved general-purpose syndicate enamels, household brushing coatings and toy refinishing enamels. It is said to meet also the strict requirements for coating agricultural implements, and for enamels for re-coating such equipment. It also possesses marked advantages in metal decorating enamels, where it bakes very rapidly to a tack-free film, exhibits good flow, leveling and hot-slip characteristics and shows excellent retention of color and gloss.

While it is expected that Duraplex C-57 will be generally utilized as the sole vehicle for coatings in which it is used, it also has worthwhile advantages in combination with other Duraplex resins.

Address: Washington Square
Philadelphia, Pa.

C-14 Compounds

Tracerlab adds fifteen organic compounds labeled with radioactive carbon-14.

Tracerlab, Inc., is making fifteen new radiochemical compounds tagged with Carbon-14. This increases the total list of available organic radiochemicals to twenty-four.

The additions to the list are as follows

1. Ring-labeled toluene
2. Ring-labeled benzoic acid
3. Benzene
4. Methyl-labeled sodium acetate
5. Methyl-labeled ethyl acetate
6. Methyl-labeled ethyl alcohol
7. Methyl-labeled ethyl iodide or bromide
8. Carboxyl-labeled glycine
9. Carboxyl-labeled alanine
10. Methylene-labeled hexaethyl tetraphosphate
11. Methylene-labeled triethyl phosphate
12. Carboxyl-labeled benzoic acid
13. Methylene-labeled glycine
14. Carboxyl-labeled bromoacetate
15. Carboxyl-labeled 2,4-D

These compounds can be obtained directly from Tracerlab after AEC approval has been obtained. In most instances the specific activity is one millicurie per millimole.

Address: 55 Oliver St.
Boston, Mass.

Dyestuffs

Hilton-Davis adds sixteen acid and basic dyes to its line.

Sixteen acid and basic dyestuffs have been added to the list produced by Hilton-Davis.

They are: Hidacid Phloxine B (Color Index 778); Hidaco Caribbean Blue Concentrated (C.I. 663); Hidaco Basic Blue 10 G. Concentrated (C.I. 658); Hidacid

NEWS IN THE AMINO ACID FIELD

3 developments from B. F. Goodrich Chemical Company that may have possibilities for you

β-Alanine

$NH_2CH_2CH_2COOH$

This chemical, now being used by the pharmaceutical industry for the synthesis of pantothenic acid, is suggested for consideration in other fields where a low molecular weight, water-soluble amino acid may be useful. β-alanine is available in commercial quantities.

N-Dodecyl-β-alanine

$C_{12}H_{25}NHCH_2CH_2COOH$

This long chain aliphatic amino acid has unusual properties of emulsification and foam stabilization. Available in experimental quantities.

N-(Hydroxyethyl)-β-alanine

$HOCH_2CH_2NHCH_2CH_2COOH$

Containing three active groups, this amino acid may be useful in a variety of organic syntheses. Available in experimental quantities.

For further information on any or all of these new amino acids, please write Dept. CC-9, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

Good-rite
REG. U. S. PAT. OFF.
CHEMICALS

B. F. Goodrich Chemical Company
A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

AMERICAN POTASH & CHEMICAL CORPORATION

122 EAST 42nd STREET • • • NEW YORK 17, N. Y.

231 S. LA SALLE STREET CHICAGO 4, ILLINOIS

214 WALTON BUILDING ATLANTA 3, GEORGIA

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Today, Tomorrow —Always

THE fundamental policy of our Company, a heritage we value, is to make our products and our organization of such unfailing service that neither time nor circumstances shall interfere. Our long experience in manufacturing specific chemicals enables us to keep our unwritten pledge to all we serve.

OLDBURY

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Plant and Main Office:
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New York Office:
19 RECTOR STREET, NEW YORK 6, N. Y.

Metanil Yellow (C.I. 138); Hidacid Light Yellow 2 G. (C.I. 639); Hidacid Orange II Concentrated (C.I. 151); Hidacid Fast Orange G. Extra Concentrated (C.I. 27); Hidacid Brilliant Crocein Scarlet Concentrated (C.I. 252); Hidacid Fast Crimson Extra Concentrated (C.I. 31); Hidacid Azo Rubine Concentrated (C.I. 179); Hidacid Fast Scarlet 3 R (C.I. 185); Hidacid Resorcin Brown R Concentrated (C.I. 235); Hidacid Blue Black Concentrated (C.I. 246); Hidacid Naphthalene Green (C.I. 735); Hidaco Malachite Green Base (C.I. 657) and Hidacid Wool Green Concentrated (C.I. 737).

Address: Langdon Farm Rd.
Cincinnati, Ohio

Sulfa Drug

New sulfonamide effective against "sulfa-resistant" organisms.

A new sulfa drug, called sulfamylon hydrochloride 1 per cent solution, is now available from Winthrop-Stearns, Inc., to the medical profession to combat eye, ear, nose and throat infections. It is said to enjoy antibacterial superiority over other sulfonamides, because it has a wider spectrum of activity and germs do not become resistant to it.

The new product is chemically 4-aminomethylbenzenesulfonamide. It is administered by atomizer spray, irrigation or free instillation by the Proetz technic (a method of treating sinusitis by filling the sinuses with fluid).

Address: 1450 Broadway
New York 18, N. Y.

• *Menthol glucuronide,* chemical now available from Sigma Chemical Co., is useful as a substrate for bacterial preparation of glucuronidase.

Address: 4648 Easton Ave.
St. Louis 13, Mo.

• A new and improved process for *cyanoacetic acid* manufacture, announced by Kay-Fries Chemicals, Inc., gives a white crystalline material of minimum 98 per cent purity.

Address: 180 Madison Ave.
New York 16, N. Y.

• Various organic *phosphorylated compounds,* including barium fructose-6-phosphate, dipotassium glucose-1-phosphate, and barium phosphoglyceric acid, are available from Schwarz Laboratories.

Address: 202 E. 44th St.
New York 17, N. Y.

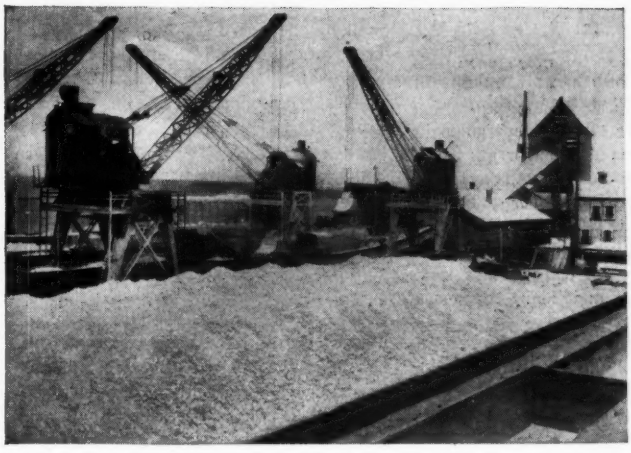
• An extensive series of rare *aliphatic ketones* is available from Sapon Laboratories in experimental quantities: hexanone-2 and -3; heptanone-4; octanone-3 and -4; nonanone-3, -4, and -5; and decanone-2, -3, -4, and -5.

Address: 543 Union St.
Brooklyn, N. Y.

SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region

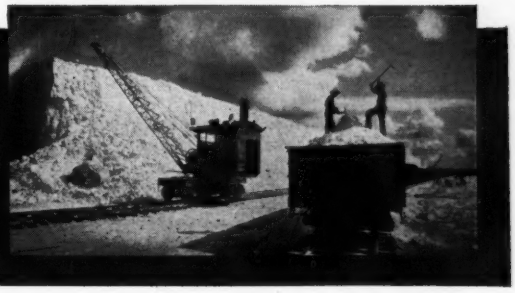
*LOADING



Sulphur intended for vessel shipment is brought to Galveston by rail from the mines at Newgulf. It is transferred directly from cars or from storage bins to the vessel.

The loading plant consists of two parallel storage bins spaced far enough apart to allow room for railroad tracks, tracks for the hoppers and cranes, and an endless conveyor belt. The belt along the center line between the bins is straddled by four cranes and their movable hoppers.

The cranes pick up the sulphur from the bins or cars and discharge into the hoppers, which automatically feed the belt. It is weighed while on this moving belt. After weighing it is discharged onto a smaller belt which in turn discharges through a cylindrical telescopic spout directly into the vessel's hold.



Loading operations at one of the huge vats of Sulphur at our Newgulf, Texas mine. Such mountains of Sulphur are constantly being built at our mines, from which shipments are continually made.

TEXAS GULF SULPHUR CO.
INC.

75 East 45th St. New York 17, N. Y.

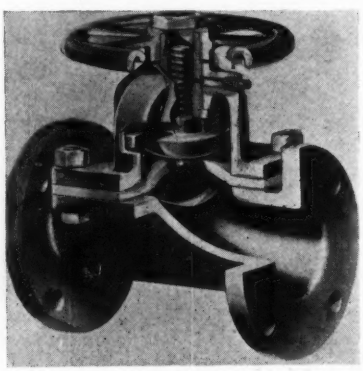
Mines: Newgulf and Moss Bluff, Texas

NEW EQUIPMENT

Diaphragm Valve

New valve permits handling 66° Bé sulfuric acid without leaking, dripping or sticking.

Hills-McCanna Co., 3025 N. Western Ave., Chicago 18, Ill., has developed a new plastic diaphragm for use in Saunders patent diaphragm valves. While the Saunders patent valve is already used in a broad variety of corrosive services, the



introduction of the new diaphragm material opens a completely new field in which the valving problems have never before been satisfactorily answered.

At the present time the company will furnish these valves in sizes from ½" through 4", with a choice of cast iron, cast steel, Durimet, or glass-lined bodies. All but the glass-lined will be available with flanged or screwed ends, the glass-lined being available only with flanged ends. All sizes are suitable for pressures to 100 psi. and temperatures to 125° F.

Valves

Fast opening and closing valves are remotely controlled.

Two new valves are now available from McRae Valve Corp., 620 S. Main St., Los Angeles 14, Cal., providing for automatic line control in an emergency.

The Sentry Automatic "Instant-Closing" shut-off valve will close all "hot" lines entering the danger area. A small tube in which a nominal pressure is maintained is connected to the valve and carried to any part of the plant and the self-operating valve mechanism functions to automatically close the valve whenever the seal on the control line is broken. As many control points as desired, of one or several types, may be placed in the single line to operate one or any number of valves concurrently.

The companion Sentry valve for "Instant-Opening" automatically provides a deluge of water at full line capacity, directed to any critical area requiring instantaneous flooding. This valve is adapted to many other applications, such as automatic dumping of tanks and pressure vessels, full pressure feed for steam, fog, or CO_2 fire smothering systems, etc. This valve also works on the principle that any emergency which breaks the seal on the control line will operate the valve or a series of valves.

Both valves are designed for full, unrestricted low to full line capacity when open and to provide a positive, leak-proof seal when closed. The valve disc has a vulcanized synthetic rubber face lapped by a special process to insure a plane surface for an absolute seal.

Pump

Rubber lining in new pump is actuated by eccentric rotor, results in positive displacement of fluid.

A non-corrosive "flex-i-liner" pump in which the transferred liquid or gas never touches any of the metal parts is available from the Vanton Pump Corp., Empire State Bldg., New York, N. Y. This unique design makes it particularly suitable for handling corrosive liquids such as acids, alkalis, and many corrosive gases.

The construction of the pump is such that the fluid flows on the outside of the "flex-i-liner" and on the inside of the body block. The "flex-i-liner" material can be specified in either a pure gum rubber or a synthetic rubber depending on the particular application. The body block can be obtained in plastic or a hard rubber. An eccentric rotor mounted on a ball bearing rides inside and activates the "flex-i-liner." The "squeegee" action thus created is the basis of the pump operation.

The Vanton pump is of the positive displacement type and self-priming. The possibility of external leakage and contamination by oil or grease is avoided by eliminating glands or stuffing boxes. The absence of check valves adds to the pump's simplicity. Maintenance is a negligible factor. Infrequent replacement of the "flex-i-liner" is the only pump service necessary. This can be done without having to remove any pipe lines or attached equipment.

Four models are available at the present time, Model A 18 (180 gph), Model A 12 (120 gph), Model A 6 (60 gph), and Model A 2 (20 gph). The units may be obtained mounted and direct-connected to a ¼ hp AC motor operating at 1750 rpm. Special requirements such as variable speed, explosion proof or completely enclosed motors can be supplied.

Mercury-Type Chlorine Cell

The De Nora cell produces 880 lbs. of NaOH and 780 lbs. of chlorine/day in a 4,000 ampere cell.

The De Nora mercury cell for production of caustic and chlorine now licensed by the Monsanto Chemical Co., 1700 S. Second St., St. Louis 4, Mo. was developed by the firm of Dott. Ing. Oronzio De Nora, Impianti Elettrochimici, of Milan, Italy. Mercury cell study was started by this firm in 1932 and the first plant built in 1936.

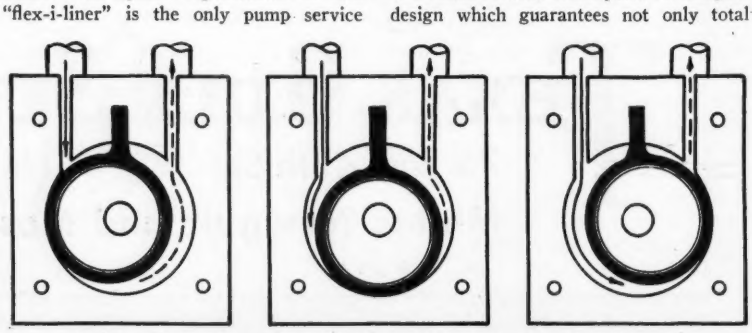
(1) In the De Nora cell the sides and bottom of the cell are lined to resist corrosion from brine, chlorine and mercury amalgam. Due to the bottom lining, if the cell be drained, it need not be washed with hot water and with dilute caustic as is the case with mercury cells having exposed steel bottoms. The type of lining used is relatively low in first cost and can be repaired or replaced in the field without special facilities. It insulates the cell so that the cell is not susceptible to external temperature variations.

Lining the steel bottom eliminates danger of hydrogen evolution and explosions because no metal parts are exposed even though mercury flow should stop. No special protection is needed against interruptions of power supply or mechanical failure of mercury pump.

The lining prevents heat losses and it is not necessary to warm the cell before starting it.

(2) Cells may be considered as operating automatically. Brine purification in most cases may be simple and inexpensive.

(3) Production of caustic is carried out in a small vertical decomposer of compact design which guarantees not only total



Rotor of "flex-i-liner", mounted on an eccentric shaft, creates a "squeegee" pressure action.

full line from a single source

BEMIS paper bags for chemicals

As one of America's largest producers of multiwalls and other paper bags, Bemis naturally makes many types to serve varied packaging requirements.

For the chemical industry, several types of construction are produced. The paper bags most generally used are shown here.

Note the variety of the Bemis line when you are buying paper bags for chemicals. It gives you wider choice in quality bags from a single source.

Bemis

Peoria, Ill. • East Pepperell, Mass. • Mobile, Ala. • Houston, Texas
San Francisco, Calif. • Vancouver, Wash. • Wilmington, Calif.

Baltimore • Boise • Boston • Brooklyn • Buffalo • Charlotte • Chicago • Cleveland • Denver
Detroit • Indianapolis • Jacksonville, Fla. • Kansas City • Los Angeles • Louisville • Memphis
Minneapolis • New Orleans • New York City • Norfolk • Oklahoma City • Omaha • Phoenix
Pittsburgh • St. Louis • Salina • Salt Lake City • Seattle • Wichita

decomposition of the amalgam but also permits a high concentration of caustic. Use of this decomposer reduces the amount of mercury in the system and mercury losses to a low figure. The decomposer requires no special maintenance. In horizontal types of decomposers the graphite grids may need to be washed every two or three weeks.

(4) The decomposer may be fed with ordinary water if caustic of maximum purity is not essential. No special auxiliary heating is required either for decomposer or cell room. Caustic concentration is over 50% by weight.

(5) The rate of flow of mercury and amalgam through the cell and the decomposer are independent so that the formation of amalgam is in a way independent from its decomposition.

(6) Purity of chlorine and hydrogen is 97± 2%and 99.8∓0.2% respectively. Hydrogen can be obtained at a pressure of at least twenty inches of water. Purity of hydrogen is higher than in other types because the decomposer acts as a scrubber.

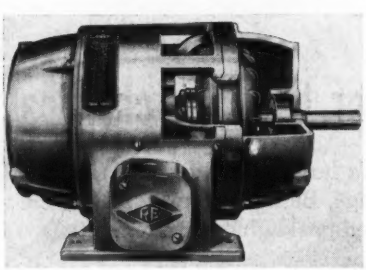
(7) In general space requirements are about half of those for mercury cells with horizontal decomposers.

(8) Cells are constructed for from 4000 to 24,000 amperes and a current efficiency of 94-6%.

Fluid Shaft Electric Motor

New motor features a single frame, integral design of motor and fluid-drive coupling.

The new electric motor design of the Reuland Electric Co. of Alhambra, Cal., is termed Fluid-Shaft. This is the first



time in history that an integrally designed electric Fluid-Drive motor has been developed.

The new Fluid-Shaft units utilize regular Reuland electric motor frames and end bells, eliminating still further the need for special, expensive parts.

Fluid-Shaft motors offer many advantages wherever loads require smooth acceleration, protection from "jamming" and shocks, or are difficult to start, such as conveyors or centrifugals.

Other advantages of Reuland Fluid-Shaft motors are: no need to overmotor, power saving, and shock absorption.

One-half, ¾, 1, 1½, 2, 3, 5, 7½, and 10 H.P. units are available in combination with motor reducers.

Heaters

New heaters provide increased heating surface.

The Brown Fintube Co., Elyria, O., has just introduced its new line of Thermo-Flo process heaters.

The new heaters consist of Brown fintubes mounted vertically between headers. They provide 8 to 10 times the heating surface as the same length of bare pipe coil and many times the heating area offered by a jacket.

The large heating area of the fintubes permits processing with low temperature differential between the heat transfer surface, and the material (i.e. at low "skim" temperature),—minimizing cracking and coking and other damage to the material from localized overheating.

Thermo-Flo heaters are available with single or multiple circular banks—in any height or diameter to meet specific duties —in low carbon or stainless steel, or nickel, monel or other alloys, to meet individual conditions. They are furnished either as individual heaters—or complete with tank.

Relief Valve

High volume relief valve without blowdown offered for pressures up to 250 psi.

The new "Series 62-A" diaphragm relief valve of C. A. Norgren Co., 222 Santa Fe Drive, Denver 9, Colo., is suited to lines carrying air, cold water, oil, insecticides and similar liquids. Operation is fully automatic. Surplus liquids can be discharged to supply tank by piping the outlet port.

All parts in contact with the air or fluid handled are brass. Synthetic rubber diaphragm, reinforced with nylon cloth, is highly resistant to oil insecticides and other fluids for which the valve is recommended. Diaphragm extends to extreme outer edges of body and bonnet—held positively in place.

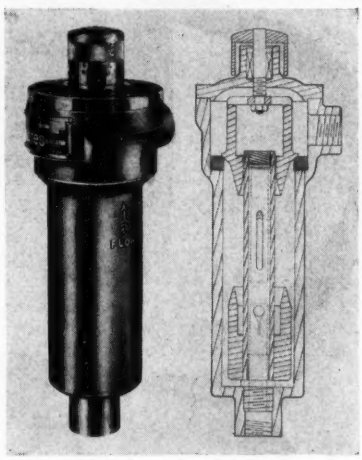
Regulating springs are available in six sizes for relief pressure ranges of: 2 to 15 psi; 15 to 50 psi; 40 to 75 psi; 75 to 125 psi; 125 to 250 psi; and 5 to 125 psi. Valves are available in ⅛", ¼", ⅜" ½", ¾" and 1" pipe sizes.

Volume Regulator

Constant volume flow under varying pressure is accomplished simply and positively by a new regulator.

The regulator, manufactured by W. A. Kates Company, Deerfield, Ill., uses no pressure pipes, diaphragm or motor operated external valve, springs, or levers and has only a single moving part. It will hold any pre-set flow volume constant while the pressure upstream may vary over a 100 psig range.

The regulating unit is contained in a vertical cylindrical case, having a valve seat and disk in a partition near its upper end. An opening in the center of the valve disk forms a differential pressure orifice and a movable disk concentric in this orifice opens and closes a high pressure valve in the lower part of the case; thus constant differential pressure (and the constant flow causing it) is regulated by the small central disk and orifice. This constant differential pressure also exists across the surrounding valve as well, and



causes constant and regulated flow through it as well as through the central orifice. Change of the opening of this surrounding valve provides variation of flow through the regulator in direct proportion to the area of opening. The usual threaded valve stem adjustment thus gives a linear scale of gpm flowing.

The only moving part is the disk in the orifice and the high pressure valve directly connected to it. This assembly is rigid and "floats" vertically without restraint except by the balancing forces of fluid pressure differential and gravity.

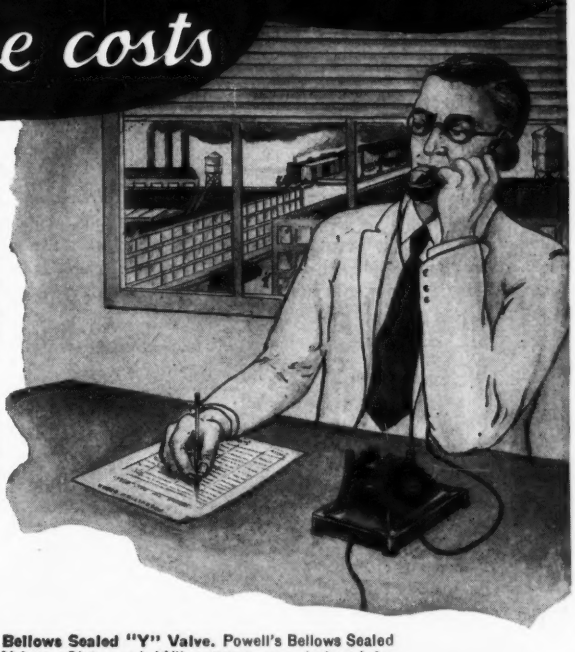
Pumps

Marlow Pumps offers greatly augmented line of diaphragm and plunger pumps.

A new wide expansion of its line of diaphragm and plunger pumps has just been completed by Marlow Pumps, Ridgewood, N. J. Presented in the new line are motor- and engine-driven diaphragm and walking-beam plunger pumps and eccentric drive plunger sludge pumps—a complete line of thirty basic models. From these basic models the range is broadened practically without limit by variations and combinations of materials, fittings and drives to meet virtually any heavy-pumping need of modern industry.

These pumps have many applications in the transfer of liquids that are too heavy for self-priming centrifugals and, according to the manufacturer, they will pump liquids that are so heavy as to be nearly solids. Transferring viscous and clotted compounds and removing trash-laden liquids and thick residues are significant among the industrial applications. These

That's right! POWELL VALVES really cut maintenance costs



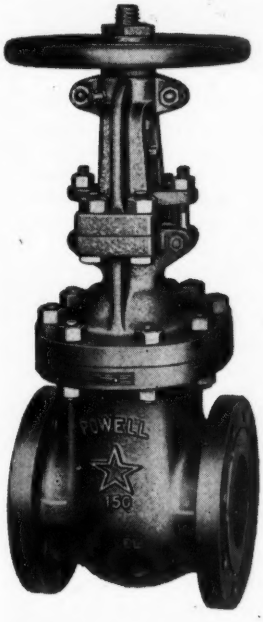
Every day, *the cost of production* is becoming a more important factor . . . and *maintenance* is a major item.

Take, for example, the cost of maintaining flow control equipment. By installing Valves that are properly designed and made of materials best suited to meet the exacting requirements of the service in which they are to be used, you not only save in the amount of wages paid out to maintenance crews, but you avoid costly shutdowns with consequent loss in production.

To build valves that give longer, trouble-free service has always been and is a prime consideration of Powell Research and Engineering. That's why it pays to standardize on *Powell Dependable Valves*. Ask your nearest Powell Valve Distributor—or write direct.

Flush Bottom Tank Valve. Made with disc rising into tank to open valve (Fig. 2309) and with disc lowering into valve (Fig. 2310).

Bellows Sealed "Y" Valve. Powell's Bellows Sealed Valves—Globe and "Y" patterns—are designed for high vacuum service and for installations where packing is unsatisfactory or fails frequently. The bellows is enclosed within the valve body, completely sealing the interior of the valve from the outside atmosphere. Available in 18-8S, 18-8S Mo., Monel Metal, Hastelloy, in sizes ¼" to 12", inclusive.



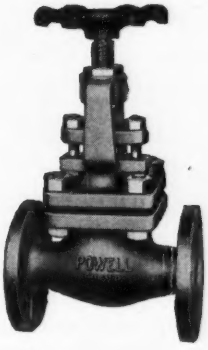


Fig. 1969—150-pound Monel Metal Gate Valve. Flanged ends, outside screw-rising stem, 4-bolted flanged yoke-bonnet, tapered solid wedge. Globe Valves are also available in this design.

Fig. 1503—Class 150-pound Cast Steel Gate Valve with flanged ends, bolted flanged yoke, outside screw rising stem, tapered solid wedge.

Powell Valves are made in Bronze, Iron, Steel and a wide selection of Corrosion-Resistant metals and alloys. Valves of every type—Globe, Angle, Gate, Check, Non-return and Flush Bottom Tank Valves—are included in the Complete Powell Line.

Fig. 1845—200-pound Nickel Swing Check Valve with screwed-in cap and regrindable, renewable disc.

The Wm. Powell Co., Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

POWELL VALVES

pumps are said to pass large quantities of bulky debris, will not readily air-bind or gas-bind, and will operate efficiently on suction lifts as high as 20'.

Normal duty engine-driven diaphragm pumps that are basic in the new line include two 3" models and three 4" models. Capacities are from 3000 to 9000 gph.

Basic heavy duty engine-driven walking beam plunger pumps in the line include a 3" single model, a 4" single and a 4" double model, all supplied either base mounted or with steel wheels or pneumatic tires. Capacities of this group range from 4200 to 6500 gph.

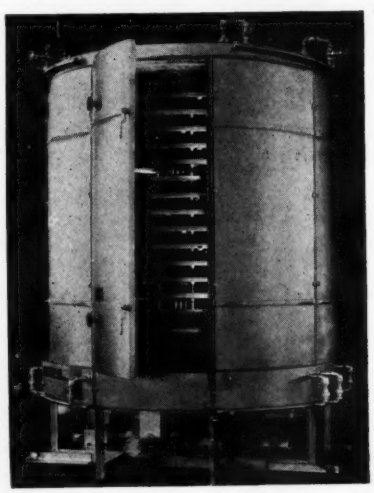
Walking beam diaphragm and plunger pumps, other than engine-driven, include 3" and 4" single diaphragm pumps with electric motors or arranged for belt drive. These are classed as normal duty models. Heavy duty models under this category include 3" and 4" single plunger pumps, electric motor driven and also arranged for belt drive. 4" double diaphragm and 4" double plunger models, both motor driven or arranged for belt drive, are designed for larger capacity requirements. Capacities range from 3000 to 9000 gph.

Eccentric drive plunger sludge pumps in the line are of two types termed "PE" and "RPE." Type "PE" is powered by a standard horizontal motor, V-belt transmission and reduction gearing. Type "RPE" makes use of a gear head motor and roller chain drive. The principal speed reduction of this type pump is obtained through the self-contained geared transmission. Both types are supplied also with vari-drive motors for use where the application requires varying capacities. Sizes are 4" and 6", capacities 3000 to 14,400 gph.

Cooler

Wyssmont's Turbo design has been adapted to cooling of hot solids.

The Wyssmont Co., 31-04 Northern Blvd., Long Island City 1, N. Y., accomplishes cooling in its new Turbo Cooler by circulating air at a controlled velocity



over the surfaces of the material that have been freshly exposed by the transfers. Material entering through an opening in the roof of the cooler moves downward from tray to tray after each revolution. When it reaches the bottom it is swept out through a discharge chute.

The circulating air may be cooled within the unit by installation of cooling coils between the trays and housing, or externally by recirculating a predetermined volume of air through cooling coils located in a duct outside the unit. For cooling material from relatively high temperatures, recooling of air is omitted. Room air is drawn in at the bottom and leaves heated at the top.

Maintenance and repairs are low. There are only two rotating parts—a rotating structure carrying the trays, and centrally located fans mounted on a vertical shaft turning on ball bearings.

Turbo Coolers are available in steel, aluminum or stainless steel for parts coming in contact with the material to be cooled. Trays may also be obtained of Chemstone or Transite. Other materials of construction are available.

Solenoid Valve

New electro-pneumatic solenoid valve has a Teflon seat.

The new valve of The Annin Co., 3234 Mines Ave., Los Angeles, Calif., provides

SAFE!

YES, YOU'RE SAFE FROM CORROSION WHEN YOU PROTECT PLANTS AND EQUIPMENT WITH

TYGON PAINT

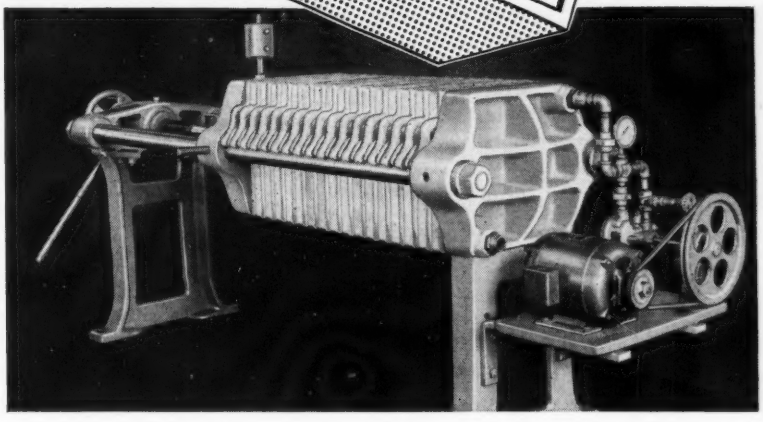
TYGON PAINT is made from chemically inert plastics dissolved in a solvent vehicle. It is applied by spray gun or brush . . . air dries quickly to form a tough, durable, tight-adhering protective plastic film. A Tygon Paint film will not oxidize, will not flake-off, craze or alligator. It will not support combustion.

Use Tygon Paint to protect plants and equipment from attack by corrosive fumes or gases, from acid spillage, or condensates. It will save you time, money and worry.

Write for your free copy of Bulletin 709 and learn how Tygon Paint can help cut your maintenance costs. Address Plastics & Synthetics Division, The U. S. Stoneware Co., Akron 9, Ohio.

U. S. STONEWARE
Akron 9, Ohio

a cetic acid to Z inc salts



PERFECTION IN FILTRATION covering the whole alphabet of filtered chemicals and other products . . . that is Sperry's record. Based on over a half-century of experience combined with a thorough understanding of today's techniques, this perfection in filtration means a finer quality product at lower cost.

Investigate the Sperry Plate Filter Press today. Discuss your filtration problem with Sperry and find out how the advantages of low first cost, plus ease and flexibility of operation and low labor cost, can be applied to your own particular manufacturing process. Sperry engineers are always at your service.

D. R. SPERRY & COMPANY • BATAVIA, ILLINOIS

Filtration Engineers for Over 50 Years

Eastern Sales Rep.: H. E. Jacoby, M.E., 205 E. 42nd St., New York 17, N. Y. Phone: Murray Hill 4-3518

Western Sales Representative: B. M. Pilhashy, 833 Merchants Exchange Bldg., San Francisco 4, Calif. Phone: DO 2-0375

SPERRY FILTER PRESSES

LOOK WHAT'S HAPPENING
on the Texas Coast

HERCULES STRONG FOR TEXAS

The Hercules Power Company has taken over a 26-acre site in the San Jacinto Ordnance Depot near Houston, to which it has moved its plant from Louisiana, Missouri. In its new location the company will act as a contract operator for the government, producing anhydrous ammonia. Production starts this summer, is expected to reach a total of 50 to 100 tons daily. Ammonia will be distributed to other manufacturers in the area to be used in the making of ammonium sulphate for fertilizers.

SOUTH TEXAS COTTON OIL INSTALLS NEW PROCESS

A $400,000 plant has recently been completed by South Texas Cotton Oil Company of Houston to produce hydrogen from natural gas by the Girbitol process. Built by the Girdler Co., it is said to be the second such plant in the country. Capacity is 200,000 cubic feet of hydrogen a day, most of which is to be used by the company itself in the hydrogenation of cotton seed oil for cooking fats.

TALL TALE... BUT TRUE

A rancher, interested in seeing a Champion bull, arrived at the Fat Stock Show with his wife and ten children. When the ticket-taker requested 50c apiece for those over 12 years and 25c for those under, the rancher appealed to the assistant manager.

"Me and the family come 200 miles to see that Champion bull, but we can't afford $3.75 for tickets."

"All those children yours?" asked the official.

"Yep."

"Well, you come right on in as our guests, Mister. We want that bull to see you!"

THE CHEMICALS ARE COMING

One by one the big names in the chemical industry are discovering the opportunities offered by the Texas Gulf Coast. And established industries are expanding, installing new processes. Investment is already around the billion mark and this is only the beginning. Check for yourself these attractions: unlimited quantities of acids, bases, fresh water and natural gas for hydrocarbons; reasons why your industry can profitably FOLLOW THE TREND TO TEXAS.

To help you find out more about the area we serve, we will gladly: (a) make a survey engineered to your company's needs; (b) supply you with any special information you require; (c) show you the coast country from Orange to Corpus Christi—all in strictest confidence. Write, wire or telephone Houston Pipe Line Company, Houston, Texas.

HOUSTON PIPE LINE CO.

Subsidiary of Houston Oil Company of Texas

GEO. A. HILL, JR., President

Wholesalers of Natural GAS

a positive and dependable solenoid-operated valve for controlling fluids up to 3000 psi.

Using a secondary pressure source such as air, gas or liquid at normal pressures from 50-300 psi through a 3-way pilot solenoid, control valves from ¾" to 8" are readily operated.

The exclusive "Annico Teflon Seat Seal" guarantees positive, dependable bubble-tight shutoff.

Valves are available in carbon steel, type 316, stainless, Durimet 20, Hastelloy "B"-"C"-"D", nickel and Monel. Many of the 1520 series of valves are now in service controlling liquid oxygen (-298° F), fuming nitric acid, sulphuric acid and alcohol. Helium, nitrogen, hydrogen and many other gases at high pressures are also being handled.

• Palmetto Pisto-Ring *packing*, designed for inside-packed reciprocating pump service, has been presented by Greene, Tweed & Co., North Wales, Pa. They have the following outstanding advantages:

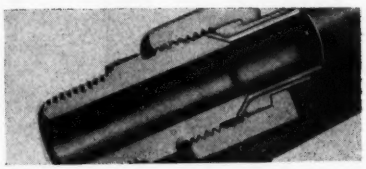
1. Molded to exact size, easy to install, no special tools or skill required.
2. Flexible and resilient, will not crack.
3. Impervious to boiler feed water, salt water, fuel oil, lubricating oil, gasoline, brine, alcohol, and most acids and alkalis; therefore they do not swell or shrink in service.
4. Heat resistant up to 450 F.
5. Self Lubricating, will not wear or score cylinder.

Pisto-Ring packing, applicable for all inside-packed piston packing, is available in sixteen sizes from 5¼" OD and 3¾" ID to 14" OD and 12½" ID. Widths range from 13/32" to ¾". Special sizes to specification are obtainable.

• Sintering Mach'y. Corp., Netcong, N. J., has developed a "unit type" *belt conveyor scale*, the Transportometer, which is assembled and shipped as a complete unit. Fewer than a dozen bolts are required for installation. It can be installed on any existing horizontal, inclined or declined belt conveyor of any width or speed, to automatically and continuously weigh, indicate and totalize the tonnage at any rate up to 2000 tons per hour. Transportometers can be provided with remote mounted chart recorders, tonnage indicators, duplicate totalizers and predetermined batch counters.

• New efficiency in the operation of *safety and relief valves* handling viscous materials is made possible by an internal heat exchanger design developed by Farris Engi'r. Corp., Palisades Park, N. J. The heater is a steam coil built into a valve body around the seat and guide, eliminating the need for costly steam tracing. It is available in all of the Farris advanced design safety and relief valves.

• A complete line of new Parker Triple-lok *tube fittings* comprising 477 shapes and sizes is now available from The Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio. They are especially designed to meet the Joint Industry Conference (J.I.C.) Hydraulic Standards for Industrial Equipment and not only conform with material and dimensional requirements of the standard, but they have successfully undergone the rigorous per-



formance testing routine of Army-Navy Specification AN-F-47 specifically required for qualification under the new standard. The Triple-lok is a three-piece flared fitting incorporating a sleeve which acts as a lock-washer, damps vibration and prevents wiping of the flare during make-up. A 37° flare angle is incorporated in the design, which also includes dryseal pipe threads for assured leak-proof performance. All parts are made of steel, shape bodies being machined from forgings and other parts from bar stock. Stainless steel types are also available. Shapes stocked include male and female connectors, elbows, run tees, outlet tees, union, union tees and bulkhead unions. Size ranges from No. 2 (⅛" tube OD, ⅛" pipe thread) to No. 32 (2" tube OD and pipe thread).

• F. J. Stokes Machine Co., 5900 Tabor Road, Philadelphia, Pa., has completely redesigned its *mixers*. Available in 50, 100, 200 and 300 pound capacities, the new Series 21 mixers incorporate these distinct machine improvements: (1) Dust-tight lids provided with rubber gasket to prevent escape of dust; (2) Positive safety devices on the lid to shut off motor when lid is raised; (3) Variable speed control, with agitator speeds from 21-42 rpm; (4) All-welded rigid construction. Mixer design permits easy cleaning; (5) Completely enclosed drive protects working parts from dust and dirt; (6) Adjustable discharge chute, which can be tilted to any height; (7) Simplified dumping mechanism, with safety catch for locking mixer in position; (8) Pushbutton stop-and-start control, with jog button for jogging agitator around when dumping.

• The Hastings Instrument Co., of Hampton, Va., is producing an *air meter* incorporating two ranges for measurement of air velocities in the range of 0-400 and 400-6000 feet per minute. Operation of the instrument is based on a combination of the hot wire and thermopile principles. This arrangement eliminates errors due to air temperature variations.

★ A long life clearly predicted . . . Thanks to Hackney construction!

Long life and Hackney 2-Piece Acid Drums are synonymous—thanks to Hackney design and construction. First of all, seamless cold drawn construction means a stronger container. Then, there are no longitudinal or chime seams—just a single circumferential butt weld located between and protected by two I-bar rolling hoops.

Add to this sturdy construction special heavy forged spuds to eliminate bung failures. Then, add reinforced chime protectors for extra strength and prolonged life. And then to increase resistance to corrosion, the finished container is stress relieved in automatic time and temperature controlled furnaces.

That's why Hackney Drums make so many extra trips—why they are such economical containers.

Write for full details on Hackney 2-Piece Acid Drums

PRESSED STEEL TANK COMPANY

Manufacturers of Hackney Products

1499 South 66th Street, Milwaukee 14, Wis.

1306 Vanderbilt Concourse Bldg., New York 17
208 South LaSalle Street, Room 2073, Chicago 4
209 Hanna Building, Cleveland 15
556 Roosevelt Bldg., Los Angeles 14

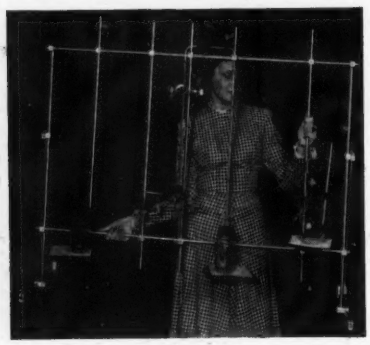
CONTAINERS FOR GASES, LIQUIDS, AND SOLIDS

LABORATORY EQUIPMENT

Support Frame

Screwdriver assembles interchangeable rods and anchors into rigid frame.

A system of interchangeable rods and anchors developed by The Chemical Rubber Co., 2310 Superior St., Cleveland,



Ohio, enables the technician to erect rigid supports for practically any laboratory assembly.

There are only three parts: first, hard aluminum rods of ½" diameter; second, anchors to attach braces and for right-angle connection of rods; and third, foot anchors for permanent attachment to bench, floor or wall. With these parts an endless variety of supports for laboratory equipment and apparatus can be built. An ordinary screwdriver is the only tool needed for assembling the frame.

Ultrasonic Generator

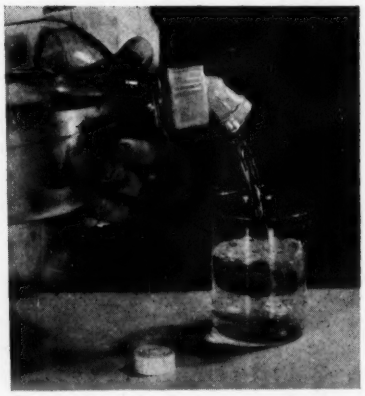
New generator provides means for laboratory study of ultrasonic vibrations

A new ultrasonic generator is being produced by General Electric's Special Products Division, Schenectady 5, N. Y. The generator converts high-frequency electrical power into high-frequency mechanical vibrations in the form of sound waves pitched considerably higher than the range of human hearing. It provides four vibration frequencies: 300, 500, 750, and 1000 kc.

Entirely self-contained in a steel console, the equipment consists of a power unit and a transducer assembly. Simple controls mounted on the sloping front panel of the generator cabinet include On-Off switches for the high voltage circuit and the filament circuit, a voltage control to vary the power, and an instrument which indicates the power supplied to the quartz crystal.

The transducer assembly is mounted on top of the cabinet. It consists of a transparent cylinder to hold insulating oil around the high voltage leads coming from the electronic circuit to the crystal. The transducer, or crystal, forms the bottom of a test well which is immersed in the insulating oil. Material to be tested is placed in a suitable container—a beaker or test tube—within this well and is directly exposed to vibrations from the crystal. Power input is 500 watts at 115 volts, 50 cycles, while power output is 200-250 acoustical watts.

Safety Spout



The new polyethylene pouring spout of Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa., provides safety in pouring acid from standard 5-pint bottles or one-gallon jugs.

Mercury Cleaner

Contaminated mercury can now be cleaned without distillation.

Laboratories and industrial plants may now clean metal-contaminated mercury for re-use through new method just developed by the Bethlehem Apparatus Co., of Hellertown, Pa.

It is said that even badly fouled mercury can be transformed in several hours into a product suitable for exacting use. The process requires little attention and costs little more than the electric current charge for running the apparatus motor.

The apparatus consists of a glass drum into which the mercury is poured, with an agitator, electric motor, and receptacle to hold the clean mercury. Normally all the operator must do is flick the motor switch, and let the agitator run for several hours.

The cleaning process is founded on the principle that base metal contaminations oxidize and precipitate from the mercury as metallic oxide powders. The agitator beats the mercury into a thick spray. This provides maximum air contact with the mercury droplets. As the mercury is agitated, any metals which oxidize and form skins will, on prolonged air contact, produce all the skins they can possibly form. As these skins are continually broken up, nothing is left but dry, pow-

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NO SCORE for centrifugals in any inning . . . when you pack with PALMETTO PALCO®!
On centrifugals pumping water or handling any neutral fluid to 275 F, there's no chance of scoring pump sleeves if the packing is Palmetto Palco.
Palco won't score because it can't score. Built of cotton roving, each strand is separately saturated with a Palmetto lubricant that provides a self-lubricating packing. Friction created is negligible.
Available in coil or ring . . . plaited square to required sizes. Write today for full particulars on this and the full line of Palmetto packings for all industry.
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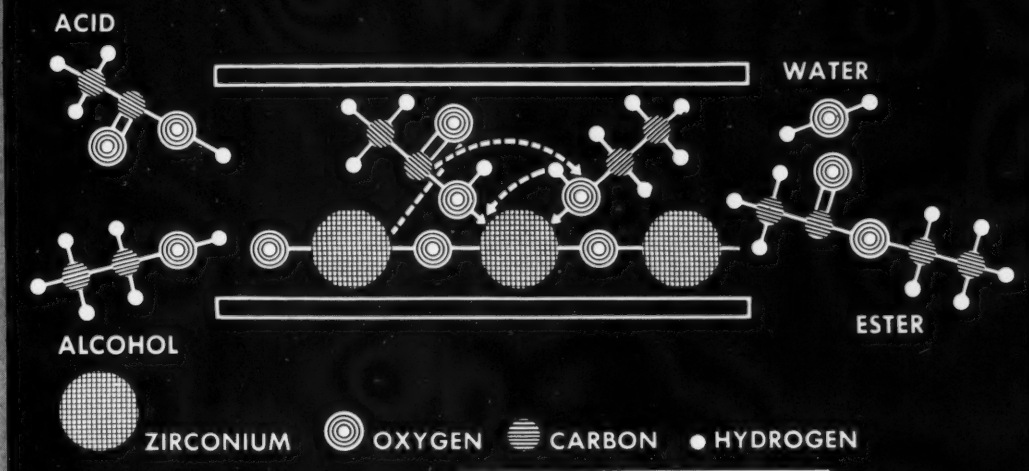
Contact your fully-stocked Palmetto distributor on all packing problems . . . ask him about our special tools.

Rapid esterification process with high yield utilizes...

ZIRCONIA *Catalyst*



Among a variety of catalytic effects of Zirconia, the best known include:

THE ESTERIFICATION OF ORGANIC ACIDS WITH ALCOHOLS

THE PRODUCTION OF BUTADIENE

THE CRACKING OF HYDROCARBONS

THE CONDENSATION OF CERTAIN ORGANIC ACIDS

Research results show that Zirconia catalysts are effective in speeding many organic reactions. High yields of important commercial chemicals can be realized through their use. Zirconia is an extremely stable material and can be recovered quantitatively from a reactive system in which it is employed. It is non-toxic. In many ways, it is an ideal catalytic substance for processes yielding products that require high purity.

More detailed information will be supplied upon request to our New York office where data on other TAM industrial chemicals also may be obtained.

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VARIABLE SPEED SHAKER FOR YOUR LABORATORY

With Utility Box Carrier Operates from 100 to 300 Oscillations per Minute

Carrier measures 18" x 12" x 4" deep; it will handle a 5 gallon bottle as shown or the sliding clamps can be adjusted to hold various size and shape containers.

The sturdy motor has substantially constant torque from no load to full load at any given operating speed. The carrier is attractive anodized aluminum; the base is finished with instrument black wrinkle.

No. 75-683A shaker described and illustrated above sells for $175.00. Single and two speed shakers as well as carriers for 250 and 500 ml. flasks are also available.

Ask for Bulletin 100-H on Eberbach Shakers

Eberbach & Son Company
Laboratory Apparatus & Supplies
Established 1849
Ann Arbor, Mich.

dery, and non-cohesive oxide which can be separated from clean mercury beneath.

After being agitated, the mercury is transferred to a receptacle where it is held to allow oxide particles to rise to the surface; then, after filtering, it is ready for use. Where physical dusts, oils, or greases adhere to the surface, the new Type F "gold adhesion" filter removes them in a few minutes.

Noble metals, such as gold, are not removed by the oxifier. Since gold is in no way detrimental to the value of mercury in physical apparatus, there is no need to remove it except where absolute chemical purity is imperative.

• For accurate and convenient determination of vapor-liquid equilibrium, the Emil Greiner Co., 161 6th Ave., N. Y. 13, N. Y., has developed the new, improved Othmer *still.*

Vapors in equilibrium with the boiling liquid mixture in the boiler are completely condensed in a distillate trap and the overflow from the trap is refluxed to the boiler. When the composition and quantity of vapor leaving the boiler is exactly equal to the composition and quantity of distillate returning to the boiler, equilibrium is established and the boiling point remains constant under the total pressure imposed on the systems. Samples of the liquids in the boiler and trap are then removed for chemical or physical chemical analysis to determine the compositions of the respective liquid and vapor phases in equilibrium.

• New design features of the *Electroanalyzer* of the Central Scientific Co., 1702 Irving Park Road, Chicago 13, Ill., provide convenience and save time in quantitative measurements of the electrodeposition of metals. Six sets of fixed anode-cathode positions permit simultaneous determinations. Air or gas agitation is controlled at each station. A selector switch permits reading voltage at any station. A maximum of 5 amperes DC can be applied to any or all of the stations. Single stations may be quickly removed with the snap of a switch. Current flowing through the circuit is controlled by a knob on the front panel. A voltmeter reading 0 to 8, and an ammeter reading 0 to 5 are mounted on the front panel.

• Coleman Instruments, Inc., 318 Madison St., Maywood, Ill., is producing a new *photo-electric colorimeter.* The new Model 8 is a filter colorimeter in which have been incorporated the following features: 1. Rugged, taut-suspension galvanometer. 2. Dual capability of direct-deflection reading, for speed, and potentiometric balance for precision. 3. Removable and interchangeable scale panels. 4. Wide choice of cuvettes. 5. A fine set of carefully selected and rigidly mounted optical filters.

More than just the chemicals you need

The Chemcel Plant of Celanese Corporation of America, at Bishop, Texas, where organic chemicals are produced from petroleum natural gases.
At left is a view of typical pilot plant at the Celanese Petroleum Chemicals Research and Development Laboratories, Clarkwood, Texas.

Look to Celanese Corporation of America for more than just the filling of your immediate order for organic chemicals. More than 17 years of research in petroleum chemistry and the most advanced plant facilities enables Celanese to understand, anticipate and meet your chemical needs.

Consider these advantages:

- VOLUME SUPPLY OF QUALITY-CONTROLLED ORGANIC CHEMICALS
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- LOWEST POSSIBLE PRICES TO INDUSTRY
- DISTRIBUTION AND STORAGE FACILITIES AT STRATEGIC LOCATIONS
- CONTINUOUS RESEARCH AND DEVELOPMENT

Celanese technical service is always available to assist you in improving your production processes. You will be interested in the newly published Celanese Chemical Brochure which will be sent on request.

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Chemical Division, Dept. 52-1, 180 Madison Avenue, N. Y. 16

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ALDEHYDES • ALCOHOLS • ACIDS • GLYCOLS • KETONES • SOLVENTS • PLASTICIZERS

PACKAGING & SHIPPING

by T. PAT CALLAHAN

Developments to Feature Packaging Institute

Seven thousand industrialists will attend the Second Wayne University Packaging and Materials Handling Institute conducted by The Society of Industrial Packaging and Materials Handling Engineers at the Main Auditorium, Rackham Educational Memorial, Detroit, Mich., October 3-7, 1949.

Sixteen discussion sessions, seminars, and panels will feature the program. In conjunction with this meeting the Fourth Annual Industrial Packaging and Materials Handling Exposition will be held. Indications are that a number of new developments in protective packaging will be revealed for the first time at this show.

Continued advancements in rust preventives will be shown with at least one firm featuring a new timing device on its tank equipment that automatically shuts off operation over week-ends and other non-productive periods. The various impregnated papers recently introduced for rust prevention packaging will be strongly represented and new applications and suggested uses will be shown.

In line with marked progress in development of corrugated boxes, there will be demonstrated new construction principles that make possible heavier loads with complete protective safety. Heavy, but small metal parts, packed in bulk are now being safely shipped in these new corrugated containers without fear of punching through or damage.

A number of other new containers and packaging materials will be shown—items that will soon be available in volume—and several new exhibitors will demonstrate these advancements.

There will be complete showings of all types of equipment for the movement of materials in plants and warehouses, as well as a number of new stationary units employed specifically for packaging processes. One of these units applies steel strapping mechanically to manufactured items as a basic function of the production or assembly line—replacing strapping operations formerly done only by hand. Another interesting unit will be an ingenious steel strapping coil holder that includes a cutting device to speed up the hand strapping operation.

Recent improvements made in stencil machines, both electric and hand operated, will also be demonstrated. Other items include improved wooden box constructions, sealing equipment and tapes, new fibre containers, advancements in labeling methods, many types of metal containers and new paper and transparent products with high tensility.

National headquarters of the Society, 20 West Jackson Boulevard, Chicago, Ill., is prepared to assist in obtaining hotel accommodations.

Materials Handling In Modern Drug Plant

Executive personnel in charge of receiving, warehousing and shipping at the new 1½-million-dollar pharmaceutical plant opened at Myerstown, Pa., by Winthrop-Stearns, Inc., and George A. Breon Co., two units of Sterling Drugs, Inc., have found that the plant's materials handling system incorporating storage battery-powered fork trucks and pallets, has been able to cope with production although this, measured in pounds of outbound shipments, has approximately tripled in a year.

Raw materials are received by rail and truck at the eastern end of the plant. Finished product goes out the west end for shipment by truck or rail to company warehouses and distribution centers. All materials used in the various medicinal and pharmaceutical products are placed in "Hold for Release" areas awaiting reports of tests for purity by the plant's control laboratory. This requires considerable warehousing area and it is in this location that the fork truck-pallet system of handling and storage has been of the greatest benefit. Raw materials come in various containers—bags, drums, barrels, cartons, and carboys. All are handled by palletizing before moving into the "Hold for Release" areas.

Upon "release," the materials are moved by fork truck and pallet to the production line. After the preparations have been packaged, and given a final laboratory release, they are moved—in palletized unit loads—by fork truck to the shipping area for transportation to the company's main distribution center.

Receiving and warehousing areas account for some 26,751 square feet, or 42.19% of the main building, while four different manufacturing and four finishing departments produce and package the items. Two fork trucks, each of 2,000-lb. capacity, and each with a 108-inch height of lift, are used to handle material. They were placed in service in January, 1948, and operate about 7½ out of the day's 8-hour shift.

Among the items handled are cartons of bottles which arrive by rail in 30-ton lots. Palletized at car-side in 1,000-lb. loads, by two men working at a car, it requires about a half-day to unload and warehouse a shipment. The fork truck operator alternates moving the palletized loads with the handling of other loads which also are received by rail. This includes sugar, which arrives in 100-lb. sacks. These sacks are placed 16 to a pallet in locked loads. Two men are assigned to the unloading of a 40-ton car, in addition to the truck operator.

Drummed and carboyed materials, such as syrups and extracts, arrive both in box car and by highway truck. Drums of corn syrup, for instance, weigh about 500 lb., and these, after weighing, are placed three to a pallet and tiered three-high in storage.

A truck handles the individual drums by sliding the forks under one of the projections on the drum's side moving the drum to the scales for weighing, then moving the drum and placing it on a pallet.

Finished product, awaiting outward shipment, is palletized in lots of from 28 to 30 or more cartons, depending upon the size of the carton. These unit loads

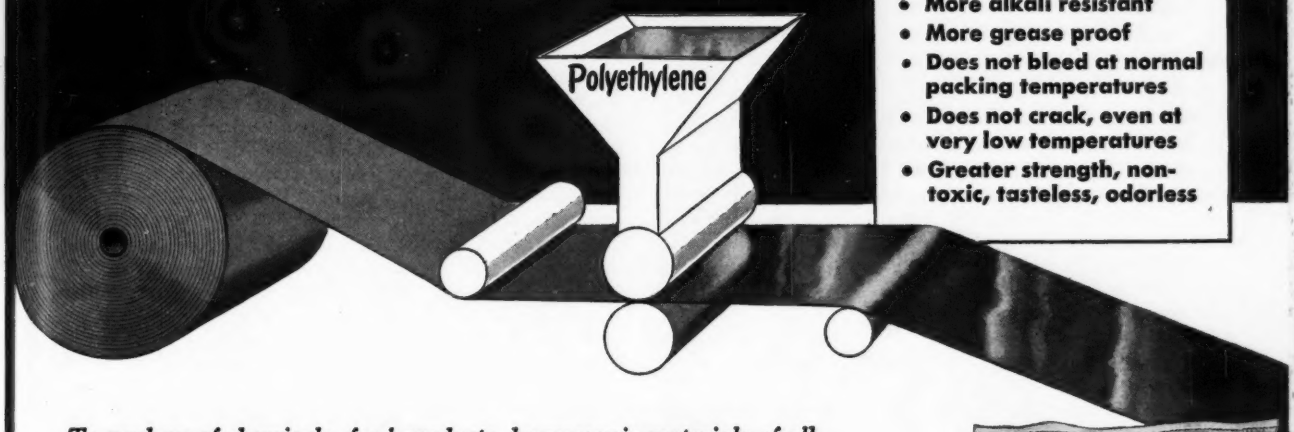
Fork truck with palletized unit load of cartons loads trailer-truck.

AN IMPORTANT DEVELOPMENT IN PACKAGING CHEMICALS—

THE ST. REGIS POLYETHYLENE MULTIWALL BAG

Advantages

- More moisture proof
- More acid resistant
- More alkali resistant
- More grease proof
- Does not bleed at normal packing temperatures
- Does not crack, even at very low temperatures
- Greater strength, non-toxic, tasteless, odorless



To packers of chemicals, food products, hygroscopic materials of all kinds, this new St. Regis bag marks an important milestone — offering a commercially practicable Multiwall with a polyethylene-coated ply.

By solidifying a film of liquid polyethylene directly on kraft paper, St. Regis produces a strong, yet lightweight, protective sheet that resists air-borne moisture and chemical reaction as no other sheet does—has good flexibility (even at extremely low temperatures), good extensibility, is compatible with other plies in the Multiwall.

ST. REGIS POLYETHYLENE MULTIWALL BAGS are now in use for packaging such items as:

Asphalt Sealing Compounds	Detergents
Beta Naphthol	Meat Trimmings
Brown Sugar	Mono Sodium Phosphate
Calcium Chloride	Polyethylene
Cellulose Acetate	Powdered Milk
Compost	Quick Lime
	Urea Resin

For full details about this remarkable packaging development, consult the St. Regis Sales Office nearest you.

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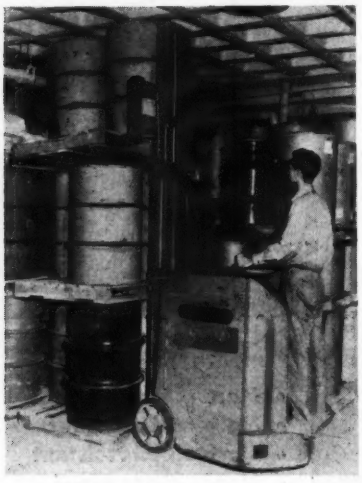
YOU BUY PROTECTION WHEN YOU BUY MULTIWALLS



Full use of vertical storage space obtained by tiering pallets three-high.

are placed in storage, being tiered three- or four-high, depending upon overhead space. In loading over-the-road trucks, the fork truck moves palletized loads up to and directly inside the body of the truck placing the pallets on roller conveyors which enable the load to be moved to the interior of the truck's body. The loads are de-palletized and stowed by the truckers.

Batteries are charged at night at a central station, being in charge of the plant electrician. Facilities for battery-change are provided by means of a waist-high rack on which the batteries are slid directly from the fork truck's body.

New Booklet Gives Tips On Air Shipping

The ninth edition of the Hinde & Dauch data book, *How to Ship By Air In Corrugated Boxes,* brings revised and up-to-the-minute information on the proper, economical use of air express, air freight and air parcel post. This newly revised volume, one of the Hinde & Dauch "Little Packaging Library" series, in addition to citing current regulations for all air shipments, describes a number of typical case histories on new types of air shipping which make possible improved distribution methods and lower distribution costs.

The rates for air shipments being based on space and weight, the booklet offers invaluable information on the use of corrugated boxes as a practical economy measure. Corrugated boxes are compact and light in weight, it is pointed out, and when properly engineered to fit the product, they provide better protection, are easier to handle and cost considerably less than most other types of air shipment boxes.

Copies are available on request to the Hinde & Dauch Paper Co., Sandusky, Ohio.

Multiwall Bags Sold in Palletized Loads

Many of the large suppliers of multiwall paper bags are now offering these bags palletized on expendable pallets. Bags are securely strapped to the pallets and this makes for a unit load of several hundred bags which effects economies in the handling and moving of bags to and from storage and to filling stations. Considerable man hours are saved in unloading and handling of palletized bags over previous bags which were not on pallets.

Carton Sealing Adhesive

Paisley Products, Inc.'s, new "Cartontite" carton sealing adhesive is now in production at its Chicago, New York and Minneapolis plants. It is said to be increasing speed of production wherever tested in small carton machine sealing operations.

Although designed originally for use on Pneumatic Scale Corp. bottom sealers in forming soap powder, cleanser, dry foods, cereal and similar cartons, it has been found suitable for successful operation on Triangle, Ferguson, Stokes and Smith, Package Machinery, National and similar carton sealing equipment. "Cartontite" is a fluid brown adhesive, prepared from a fully converted dextrine base, weighs 10 lbs. to the gallon and can be used as received or diluted approximately

KRAFT BAG CORPORATION

HEAVY DUTY MULTI-WALL

SHIPPING SACKS

OPEN-MOUTH
VALVE-TYPE
PASTED AND SEWN
including flat tube valve bag

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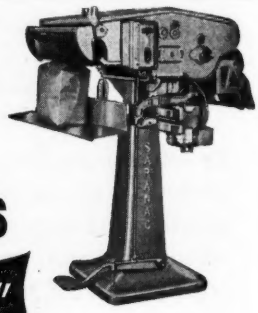
FAST ECONOMICAL SIFTPROOF
BAG CLOSURES



SARANAC D-10" BAG SEALER

"Makes the Paper Bag a Real Package"

SARANAC Bag Sealing Machines are designed to rapidly and economically close the tops of filled bags. Paper bags, bags with liners, glassine bags are quickly, securely sealed on the *SARANAC*. The same machine may be used to close the bottoms of empty bag tubes. A single pass through the *SARANAC* Bag Sealer results in a stout, sift-proof, almost hermetically sealed closure. One operator can seal as many as 75 bags per minute. Seals bags up to 10" in width.
Write for free illustrated Bulletin and ask about the *SARANAC* Proposition.

SARANAC MACHINE COMPANY
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CHECK with CONTINENTAL

IT COSTS NOTHING TO TALK THINGS OVER AND . . .

We would like to see if, because of our size and flexibility, we could assure you of a more dependable supply . . . **Check?**

. . . or suggest improvements for your lithographed designs . . . . . **Check?**

. . . or give you better service . . **Check?**

. . . or help you overcome a research or product development problem . **Check?**

So, why not "Check with Continental" today? . . . . . **Check?**

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FURFURYL ALCOHOL
Will help you

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$C_4H_3O \cdot CH_2OH$

Solvent, Resin Former, Wetting Agent

DESCRIPTION:
Amber colored liquid.

Properties:

Boiling Point (pure) °C. 764 mm. Hg	175-7
Specific Gravity (20/20° C.)	1.136
Flash Point (open cup) °C.	75
Vapor Pressure 55.5° C., mm. Hg	5.5

As a Solvent: Furfuryl Alcohol (FA) is miscible with water, chloroform, ether, coal tar solvents, and non-paraffinic hydrocarbon solvents; dissolves nitrocellulose, dyes and many resins (both synthetic and natural).

As a Resin Former: FA is reactive with phenolic compounds, formaldehyde, melamine, urea, thiocyanates and with itself, to form resins with varied and valuable properties.

As a Wetting Agent: FA is useful as a solvent and wettant in the manufacture of resin-bonded abrasive wheels and cold molded plastics.

Literature: Data Sheets, Reaction Charts, and Technical Bulletins are available to you. A request on your letterhead to the nearest office, mentioning the nature of your interest will bring you a selection of applicable literature.

The Quaker Oats Company — CHEMICALS DEPT.

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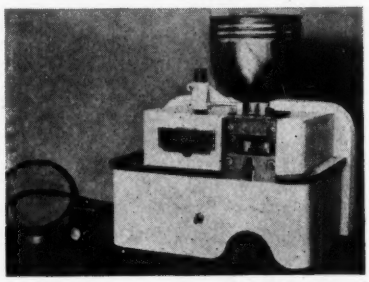
In San Francisco, The Griffin Chemical Company • In Australia, Swift & Company, Pty. Ltd., Sydney • In Europe, Quaker Oats-Graanproducten N. V., Rotterdam, The Netherlands; Quaker Oats (France) S. A. 42, Rue Pasquier, Paris 8E, France

10% with water, if desired. It is odorless, non-toxic and can be used cold, requiring no heat on the glue pans. For fastest sealing it is used full strength.

Fast Powder Filler

A powder filling machine that speeds up the precision filling of ampoules and small bottles by as much as 10 times has just been developed by the Simmons Machine Tool Corp., Albany, N. Y.

The new machine, designed for manu-



facturing chemists, accurately measures chemical, pharmaceutical, or other powders in any quantity from .01 cc. to over 7 cc., then automatically dispenses this amount into containers at strokes from 11 to 22 per minute. By contrast, output using precision weighing methods is approximately 2 per minute.

In actual operation, normal procedure is to establish the correct volume in cc. for the required weight in grams. It is then possible by micrometer screw adjustment to obtain exactly the desired volume at each stroke. For the standard maximum quantity of 7 cc. a ¾" diameter plunger is used with a 1" stroke. For the smallest quantity of .01 cc. a ¼" plunger is used with a stroke of less than 1/32". Greater or smaller ranges of strokes per minute can be provided by changes in the drive pulley ratio of the machine.

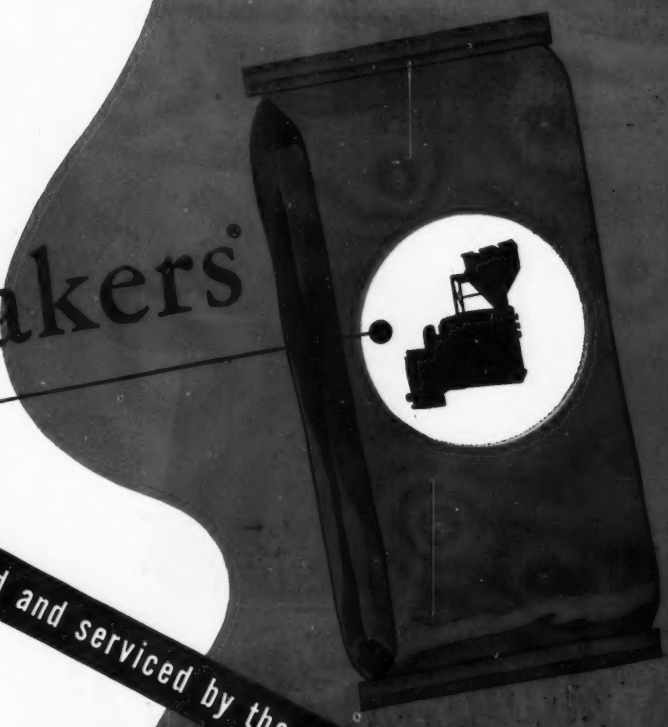
Machinery Mfrs. to Meet

The Seventeenth Annual Meeting of the Packaging Machinery Manufacturers Institute will be held at the Edgewater Beach Hotel, Chicago, from October 31-November 2, 1949.

John P. Corley, vice-president of the Institute and vice-president, Miller Wrapping and Sealing Machine Co., Chicago, is chairman of the program committee for the meeting, assisted by the following: vice-chairman, Charles L. Barr, F. B. Redington Co., Chicago; H. Lyle Greene, president, J. L. Ferguson Co., Joliet; Louis R. Muskat, president, Triangle Packaging Machinery Co., Chicago; G. Radcliffe Stevens, president, Elgin Manufacturing Co., Elgin, and Herbert H. Weber, president H. G. Weber & Co., Sheboygan, Wisc.

Holding its organization meeting in Chicago recently, Mr. Corley's committee of Mid-Western members mapped extensive plans for a three-day program of

Bagpakers®



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Who but a manufacturer of multiwall paper bags is best equipped to design and service bag packaging machinery?

Automatic advantages of faster, more efficient packaging come with automatic BAGPAKERS . . . that's why we say —

if you want a packaging machine that sews a multiwall tighter and faster — rely on a BAGPAKER . . .

if you want an automatic machine that weighs, fills, settles and seals better — rely on BAGPAKER . . .

if you want a real performer — a dependable machine that boosts and maintains production rates — rely on BAGPAKER.

BAGPAKERS and Bagpak Multiwall Bags are ideal for packing food, chemicals and fertilizers. Write for our booklet 200B—it will give you added information on these money- and labor-saving machines and multiwall bags.

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INTERNATIONAL PAPER COMPANY, Bagpak Division
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In Canada: Continental Paper Products, Ltd., Montreal, Ottawa.

There's "magic" in these six numbers

...PERHAPS "MAGICAL" PROFITS FOR YOU, TOO

WHAT DO THESE NUMBERS DO? They pinpoint the six advantages of packaging products in metal containers.

ONE: Cans fill and close easier... faster.

TWO: Cans are break-proof.

THREE: Cans protect contents from light, air, dirt, insects, moisture.

FOUR: Cans are lightweight... mean lower shipping costs.

FIVE: Cans stack easier... stay that way.

SIX: Cans mean eye-appeal for impulse buying.

What other type package gives you *all* the advantages of metal containers?

None!

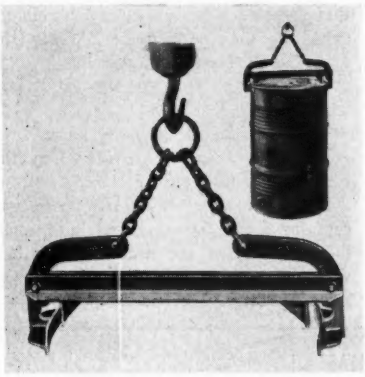
AMERICAN CAN COMPANY
New York • Chicago • San Francisco

This trademark CANCO *is your assurance of quality containers. Look for it!*

business sessions and events to attract packaging machinery manufacturers from all parts of the country.

Vertical Drum Lifter

Lifters for handling open and closed steel drums in the vertical position, by crane or hoist, are now being manufac-

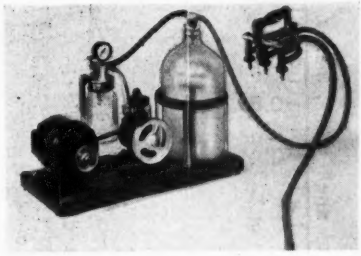


tured by Palmer-Shile Co., 16040 Fullerton Avenue, Detroit 27, Mich., designers and manufacturers of materials handling equipment.

The new lifters are of all-steel construction with a heavily welded chain. The manufacturers point out that the vertical drum lifter was developed to handle open and closed drums vertically.

Versatile Filler for Glass and Tin

The Scientific Filter Co., 1 Franklin Sq., N. Y. C., has introduced a new portable vacuum filler. This is a table model unit, a companion to its larger filler. It is de-



signed for pharmaceutical manufacturers, perfumers and others who fill a large variety of liquids in many different sizes of small containers.

This new filler is equipped with adjustable multiple spout filling heads which handle a large variety of containers in many shapes and sizes. For filling vials, miniatures and similar petite containers special heads can be furnished with as many as 9 spouts.

Filling takes place under vacuum which means that cracked, chipped or defective containers are automatically rejected without any loss of liquid. No overhead supply tanks are required as liquid is picked up

(*Turn to page 463*)

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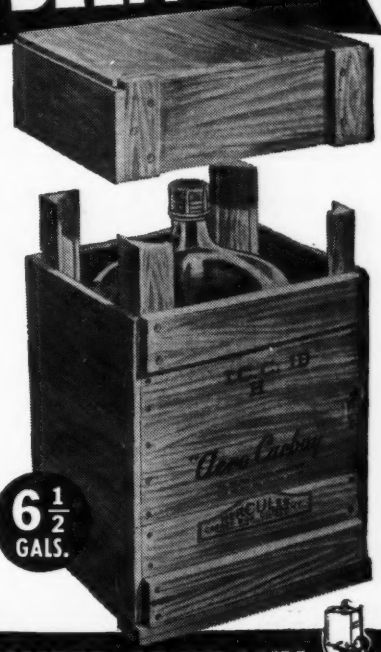

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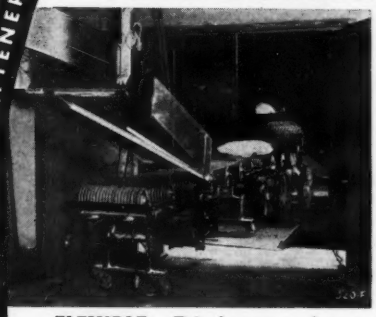

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PLANT OPERATIONS NOTEBOOK

NOMOGRAPH-OF-THE-MONTH Edited by DALE S. DAVIS

Nomograph for Determination of Shell Thickness of Steel Vessels

by C. J. MAJOR
Sharples Chemicals, Inc.
Wyandotte, Michigan

PARAGRAPH U-122 of the ASME Code for Unfired Pressure Vessels (*1*) states that the minimum required thickness of the shell of steel vessels subjected to external pressure shall be determined from Figure U-23 given on page 104 of the Code. For vessels in vacuum service the external working pressure is taken to be 15 psi.

By the use of the data obtained from Figure U-23, the author has derived the following relation between thickness, length, and diameter of steel vessels in vacuum service:

$$t = 0.0468\ L^{0.409}\ D^{0.591} \qquad (1)$$

where

t = minimum required thickness of shell plate, inches
L = length of vessel between centers of head seams or between centers of circumferential stiffeners, feet
and D = outside diameter, feet

Equation 1 is applicable to cases in which the ratio L/D is less than 15 and greater than 0.2. It is not applicable to vessels subjected to external pressures greater than atmospheric.

The nomograph presented in Figure 1 was prepared from Equation 1 using methods described by Davis.[2]

Paragraph U-36 of the Code states that the thickness of a dished head containing no openings greater than 6" in any dimension, with the pressure on the concave side, is calculated from the following formula:

$$t = \frac{5PL}{6SE} \qquad (2)$$

where

t = thickness of plate, inches
P = maximum allowable working pressure, psi.
L = radius to which head is dished, measured on the concave side, inches
S = maximum allowable working stress, psi.
and E = lowest efficiency of any joint (E = 1 for seamless heads).

For pressure on the convex side, the Code states that the thickness shall be equal to 1/0.6 times that given by Equation 2.

For steel with a working stress of 11,000 psi, the thickness of a seamless dished head in vacuum service, with openings not exceeding 6" in any dimension, is expressed by the equation

$$t_1 = 0.0227\ R \qquad (3)$$

where

t_1 = thickness of plate, inches
and R = dish radius, feet.

For dished heads with openings exceeding 6" in any dimension, the Code requires a thickness not less than 15% greater than that calculated by Equation 3 but in no case less than ⅛" greater. Using the 15% factor, Equation 3 becomes

$$t_2 = 0.0261\ R \qquad (4)$$

where

t_2 = thickness of plate, inches.

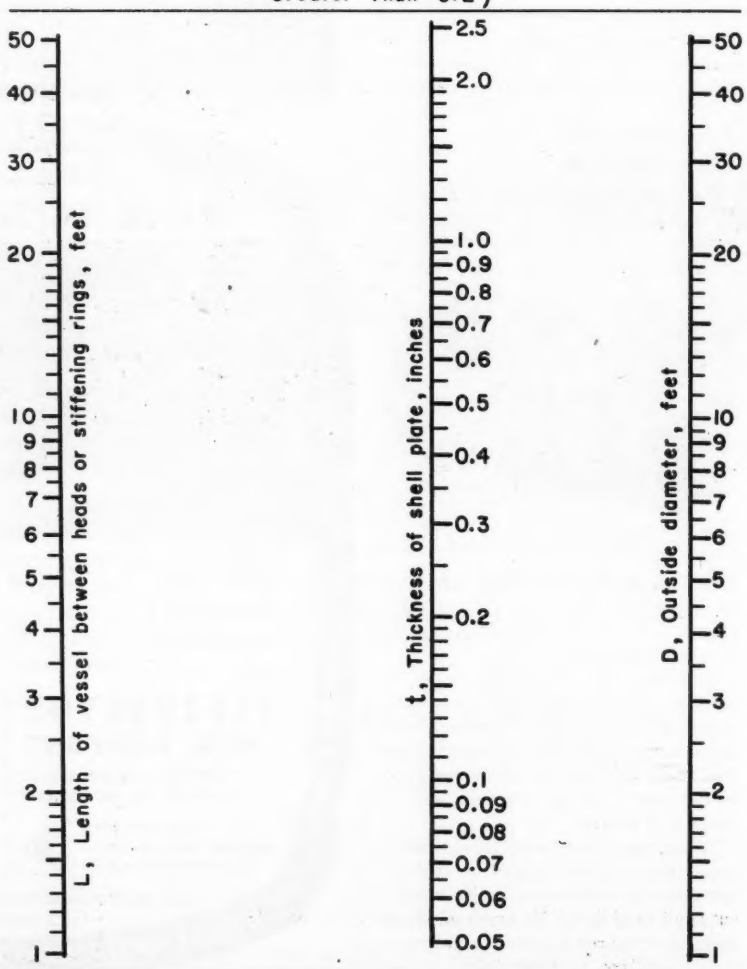
Equations 3 and 4 are solved by the chart shown in Figure 2.

The Code states that in no case, except for a full hemispherical head, shall the thickness of the head be less than that required for a seamless shell of the same diameter.

FIGURE 1

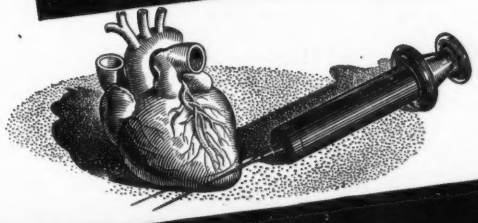
CYLINDRICAL SHELLS

(For Steel Vessels With L/D Less Than 15 and Greater Than 0.2)



FROM TOOTH PASTE

TO HEART STIMULANTS



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Technical GLYCERINE NEWS

AN EFFECTIVE METHOD OF TREATING PERITONITIS by glycerine application is described in a recent medical paper. Drs. E. D. and R. W. Smith report in *The Southern Surgeon* that glycerine induces drainage from infected tissues and exerts antiseptic and bactericidal action on the bacteria of peritonitis. At the same time, it permits normal functioning of the body cells to promote healing. (D-17)

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The following examples illustrate the use of the charts:

Example 1: Determine the minimum shell and head thickness of a vacuum vessel 6′ in diameter and 4′ in length between centers of the head seams. The radius of the dished heads is 5.5′. Openings in the heads do not exceed 6″ in any dimension.

Using Figure 1, connect 4 on the length scale with 6 on the diameter scale and read 0.24 on the thickness scale. The minimum shell thickness is, therefore, equal to 0.24″.

On Figure 2 connect Point B with 5.5 on the radius scale and read 0.125 on the thickness scale. Since this is not a full hemispherical head, the head thickness cannot be less than the shell thickness. Therefore, the head thickness shall not be less than 0.24″.

Example 2: What minimum shell and head thickness would be required for the vessel given in Example 1 if a circumferential stiffener were placed around the shell midway between the two heads?

The value of L in Figure 1 is now equal to 4/2 = 2′. Connect 2 on the length scale with 6 on the diameter scale and read 0.18 as the minimum required shell thickness. The minimum head thickness will also be 0.18″.

Example 3: What will be the minimum head thickness of the vessel of Example 1 if the head has an opening which is greater than 6″ in any dimension?

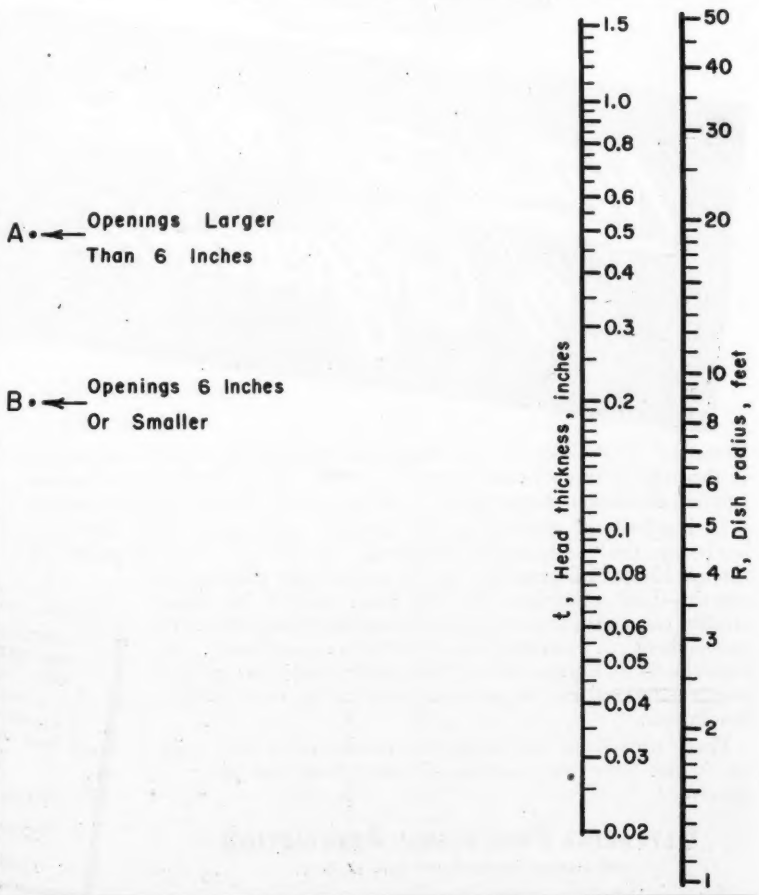
On Figure 2, connect Point A with 5.5 on the radius scale and read 0.14 on the thickness scale. Connect Point B with 6 on the radius scale and read 0.135 on the thickness scale. Since the difference between these two values is less than ⅛″, the minimum required head thickness is equal to 0.135 + ⅛ = 0.26″.

Literature Cited

1. The American Society of Mechanical Engineers, "Rules for Construction of Unfired Pressure Vessels, Section VIII, ASME Boiler Construction Code", New York, 1946.
2. Davis, D. S., "Empirical Equations and Nomography", Chap. V, New York, McGraw-Hill Book Company, 1943.

FIGURE 2

SEAMLESS DISHED HEADS, STEEL



A page from the Stauffer Catalog

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Chlorides, as Cl	12 ppm	2 ppm
Calcium, as CaO	nil	nil
Arsenic, as As_2O_3, less than	1 ppm	1 ppm
Heavy Metals	10 ppm	4 ppm
Iron, as Fe	6 ppm	2 ppm
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Moisture and Undetermined	0.18%	0.2%
Bulk Density, Lbs. per Cu. Ft.	54. approx.	50.

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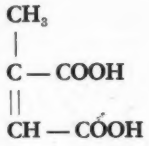

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LABORATORY NOTEBOOK

Colorimetry Standard in Error

Recent work indicates that the "ICI standard observer," that is, the fundamental data on color mixture that has since 1931 been accepted internationally for interpreting colorimetric measurements, may need revision. Since its recommendation in 1931 by the International Commission on Illumination, the standard way of interpreting spectrophotometric information for colorimetry has been by the fundamental data on color mixture known as the 1931 ICI standard observer.

Recently the Titanium Div. of the National Lead Co. reported that the ICI standard observer was not adaptable to the colorimetry of Ti-pigment paints.[2] A. E. Jacobsen found that, when the well-known near-white anatase and rutile TiO_2 pigments were incorporated in a paint vehicle, they yielded colors that could be distinguished by eye. However, spectrophotometric data reduced by means of the ICI standard observer indicated that the colors were the same. It was suggested that the ICI standard observer weighs too lightly below 430 mu.

As the first step in a study of the phenomenon by Dr. Deane B. Judd, of the National Bureau of Standards' photometry and colorimetry laboratory, a pair of these titanium-pigment paints was examined by 7 observers. Four of the seven corroborated Jacobsen's conclusion; three agreed closely with the standard observer. A modification of the standard observer was then derived, based upon the spectral luminosity determinations of Gibson and Tyndall at the National Bureau of Standards and of Wald at the Harvard Medical School. The modified observer was shown to account largely for the observations of the group of 4 observers that disagreed with the standard observer. Since this work, the Gibson-Tyndall-Wald data on spectral luminosity have had striking corroboration by Weaver of Eastman Kodak; his results likewise indicate the standard luminosity function to be too low in the short-wave spectrum.

It is recommended that further studies of the luminosity function in this region be conducted, particularly by foreign laboratories, so that a broad and sound basis for a possible revision of the ICI standard observer may be laid. Until such time as a revision is made officially by an international body, however, the National Bureau of Standards will continue to base its color standards on the 1931 ICI standard observer.

[1] For further technical details, see "A comparison of direct colorimetry of titanium pigments with their indirect colorimetry based on spectro-photometry and a standard observer," by Deane B. Judd, which will appear in the September 1949 issue of the NBS Journal of Research.
[2] Jacobsen, J. Opt. Soc. Am. *38*, 442 (1948).

Celsius vs. Centigrade

The Ninth General Conference on Weights and Measures, held in October 1948, adopted the name "Celsius" for the scale of temperature which has more commonly been called "Centigrade." This action, which had not been proposed in advance of the Conference, arose from a question regarding preferred usage in French, the sole official language of the Conference. The decision therefore may be considered as applying strictly only to that language. In the interest of eventual uniformity of practice the use of "Celsius" appears desirable, but it is not practicable to impose this term on those who prefer "Centigrade."

In preparation for the General Conference the National Bureau of Standards submitted a revised text defining the International Temperature Scale to supersede that adopted in 1927. The proposed text was drafted in English and, in accordance with common English practice as well as the official French text adopted in 1927, it used the name "Centigrade." This name was carried over into the French translation prepared for consideration by the Advisory Committee on Thermometry in May, 1948. However, in the printed report of that meeting, the term "Centigrade" had, in most cases, been changed to "Centésimale," the term that is used in the French law governing weights and measures. When asked to choose between the two the International Committee on Weights and Measures and the General Conference voted to substitute "Celsius."

With regard to the merits of the decision it may be remarked that Celsius (abbreviated C) is analogous to the names Kelvin, Fahrenheit, Réaumur and Rankine used for other temperature scales, that it has previously been used considerably in some countries, and occasionally in America, being included in Webster's dictionary. It might also be argued that "Centigrade" is logically ambiguous, since the absolute Kelvin scale, as well as the "Centigrade" scale, has 100 degrees between the ice point and the boiling point of water. On the other hand, the name "Centigrade" is thoroughly established in English-speaking countries, the need for choosing between that name and "Centésimale" arises only in French, and the decision on a term in the official French language of the Conference may not be considered as controlling the terms to be used in translating into other tongues.

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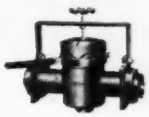

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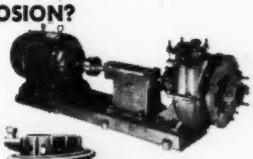

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ABSORPTION AND REACTION TOWER CORROSION?
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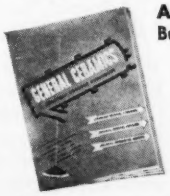

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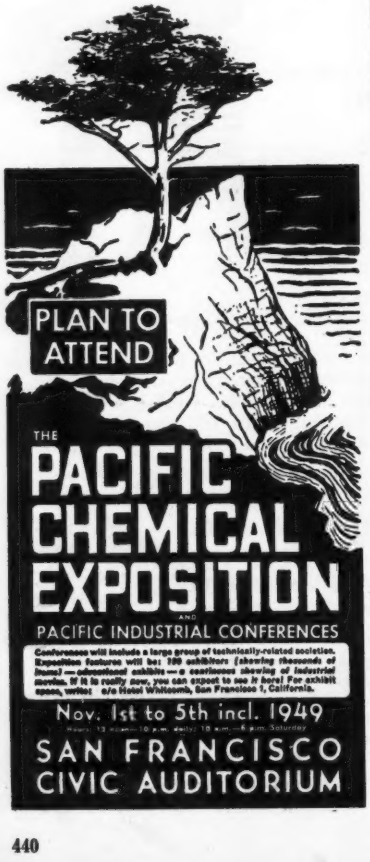

INDUSTRY'S BOOKSHELF

Fischer-Tropsch

SYNTHETIC PETROLEUM FROM THE SYNTHINE PROCESS *by B. H. Weil and J. C. Lane.* Remsen Press Division, Chemical Publishing Co., Inc. New York. 303 pgs. $6.75. Reviewed by Herman W. Zabel, ASSOCIATE EDITOR.

THIS TEXT is an admirable literature search on this complex and difficult subject. However, it is not exhaustive in the sense of covering *all references* on any given phase of the subject. For example, the authors do not note that the OXO process was first carried on by the Bureau of Mines and reported in 1930. It is exhaustive in that practically *all variations* of the process are surveyed. This book is a most excellent starting point for anybody wanting to study the subject.

Several groups active in the field will quarrel with the authors' choice of synthine as a generic term for the process. However, a shorter and easier term than Fischer-Tropsch is required.

The reviewer would like to quarrel with the continued use of extremely early data to describe the economics of the process. These data do not support the conclusions contained in the later chapter, "The Current Situation." More emphasis should have been placed by the authors on the fact that the data used is old and very much out-of-date, or else it should have been omitted.

Food Chemistry

TRACE ELEMENTS IN FOOD *by G. W. Monier-Williams.* John Wiley & Sons Inc., New York, 511 pp.; $6.00. Reviewed by Harold H. Williams, Professor of Biochemistry, Cornell University.

MR. MONIER-WILLIAMS, formerly Inspector of Foods, Local Government Board and Chemist in Charge of Food Research Laboratory, Ministry of Health, England, has attempted to present a comprehensive survey of all the elements which are present in the human body, and in most foods, in amounts up to 0.005 per cent. Of the more than thirty elements covered in this book (twenty-eight chapters), twenty-six are dealt with in individual chapters.

For the most part, each chapter is sharply divided into two parts. The first part presents a summary of amounts of the element that may be found in foods and its nutritional or toxicological significance. The second half of each chapter is devoted to the appraisal of available analytical methods for the elements in food. An extensive list of references follows each chapter.

The unique contribution of this book is the informative appraisal: first, of the extent to which the presence of the trace elements in food is due to their being essential or occasional constituents of plants, or to the use of their compounds in agricultural practice; and second, of the many ways in which they may gain access to food from manufacturing processes or commercial usage.

There are no tables listing the content of trace elements in food, and to some, this may be a serious omission. Instead, a summary of the recorded range of the concentrations that have been found in foods is included. With the wide variations in the composition of food stuffs and the difficulties involved in setting up tables of food composition, the method used by the author should appear to be a wiser procedure.

The index, although not detailed, is adequate and provides easy access to the information contained in the book.

This book should be of particular value to food chemists, especially in the food processing industries. It contains much information useful to the nutritionist and toxicologist.

Polymer Congeries

HIGH MOLECULAR WEIGHT ORGANIC COMPOUNDS (Frontiers in Chemistry. Volume VI), *R. E. Burk and Oliver Grummit, Editors.* Interscience Publishers, Inc., New York, 1949; 330 pp., $5.50. Reviewed by E. M. Beavers, Head, Exploratory Polymer Laboratory, Rohm & Haas Co.

LIKE the earlier volumes in this "Frontiers in Chemistry" series, Volume VI is a collection of papers and lectures by authors prominent in their fields, published under the sponsorship of Western Reserve University. The present volume contains an interesting selection of topics (not as comprehensive as the title implies) on organic polymers. Flory's monumental paper on condensation polymers, which appeared originally in *Chemical Reviews,* especially deserves a reprinting in the handy form this book represents. There are also sections on emulsion and suspension polymerization, osmometry and viscosimetry, proteins, rubber, and phenoplasts.

The editors have not provided any continuity to unify the book, and the papers differ widely in method of treatment of their subjects. In some places, the treatment is almost casually descriptive and

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informal, while in others, the experimental and specific approach is carefully made.

The reader encounters perhaps more than the average number of typographical errors. Probably the most obvious oversight is Table IV, on p. 16, which is referred to at least twice in the text, and which does not contain the data claimed for it. The missing table is apparently not to be found anywhere in the book. Some discontinuities at places, frankly acknowledged by the authors, are caused by updating without revising extensively.

The individual papers are well documented, and this volume should be a valuable starting place for reference work on the topics in polymer chemistry with which it deals. It is not a book of distinction which many will buy for their personal libraries.

Surface-Active Agents

SURFACE-ACTIVE AGENTS—THEIR CHEMISTRY AND TECHNOLOGY, *by A. M. Schwartz and J. W. Perry.* Interscience Publishers, Inc., New York. 579 pp., $10. Reviewed by J. M. Cross, Research Department, General Aniline & Film Corp.

DURING the past two decades surface-active agents and their chemistry have become sufficiently important to industry to be recognized as a field of chemistry. This text is the first comprehensive treatment of the entire field. The book is divided into three parts: Part I devotes 211 pages to a critical discussion of the processes for synthesizing and manufacturing surface-active agents. Part II is a compilation of 149 pages of the physical chemistry of surface-active agents in theory and practice. Part III is a 120-page survey of the practical applications of surface-active agents.

Part I is the outstanding section of the book. This section has an extensive survey of the literature concerned with the synthesis and manufacture of surface-active compounds. The coverage, particularly of the patent literature in this section, is excellent and represents considerable work on the part of the authors. By utilizing the PB reports, they have adequately covered the extensive work done in Germany in the surface-active field.

In several instances, too much space has been devoted to the subject matter of unimportant patents. The inclusion of such material is admitted by the authors to be of questionable value. Many readers would probably prefer the omission of such material, thus making a more readable but less comprehensive text.

The book is well organized and clearly written. There are 1554 references given in the form of footnotes at the bottom of the pages. The patent references placed handily with the subject matter will enhance the value of the text to its user. The book is well indexed, having 20 pages of author index and 38 pages of subject index.

This reviewer heartily recommends this book as a valuable addition to any chemical library.

Other Publications

A list of PUBLIC SERVICE PATENTS issued to research personnel in various Western agencies of the USDA's Bureau of Agricultural and Industrial Chemistry is available from its office at 800 Buchanan St., Albany 6, Cal. Brief abstracts are included and the patents are licensed royalty-free.

THE JUTE INDUSTRY IN GERMANY, 1939-1945, is the title of B.I.O.S. Over-all Report No. 17. 24 pp., 20¢, British Information Services, 30 Rockefeller Plaza, New York 20, N. Y.

HANDBOOK OF CHEMISTRY AND PHYSICS, 31st ed., 2,756 pp., $6.00, The Chemical Rubber Co., Cleveland, O. Complete revisions and new material added account for 180 pp.

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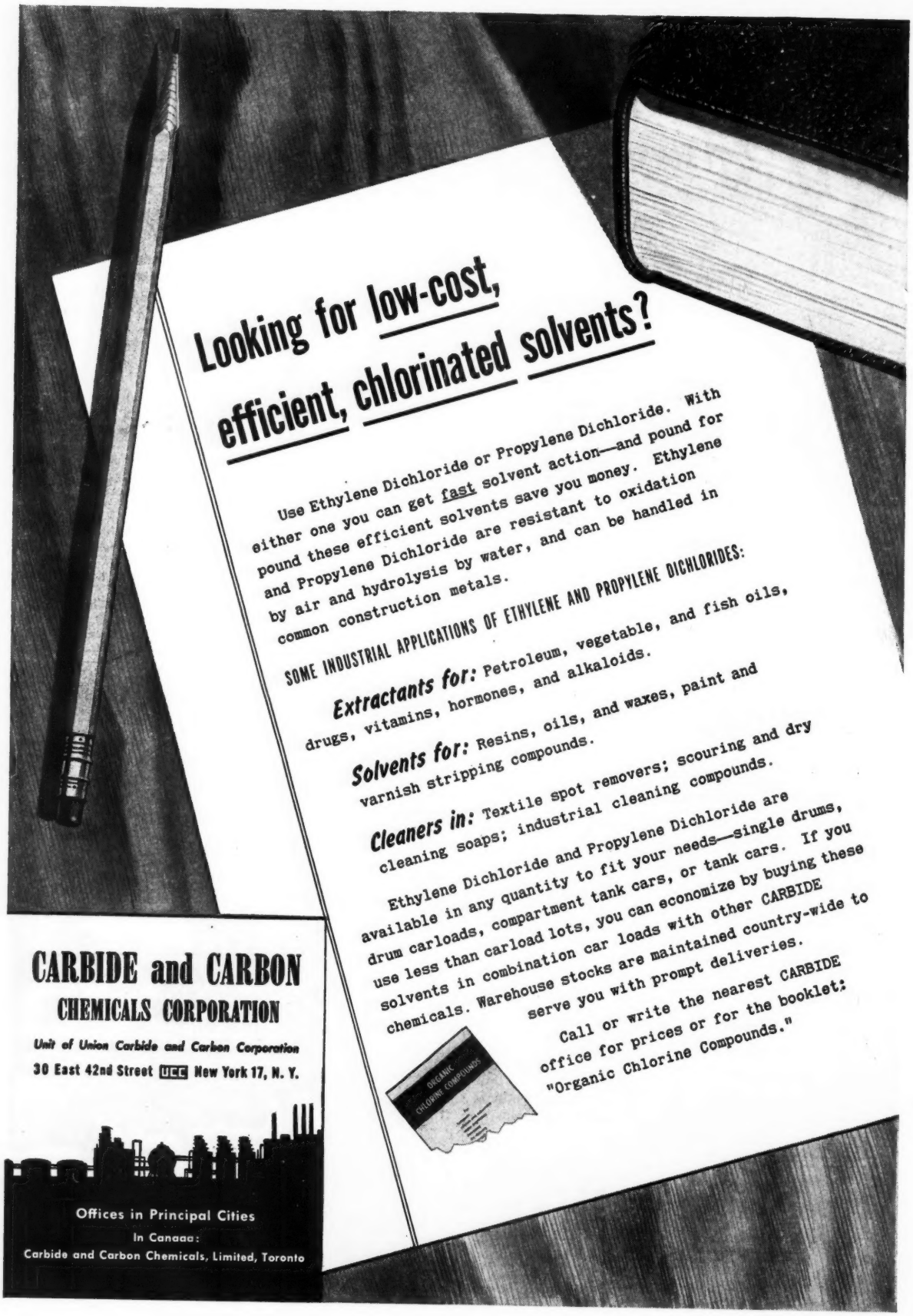
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NEWS OF THE MONTH

New Construction

The Dow Chemical Co.'s plans for construction of a $5 million ammonia plant at Freeport, Tex. have been cited as evidence of the company's optimism toward the future. The plant will have a capacity of approximately 100 tons per day. Field construction is expected to start about January 1st and it is anticipated the plant will be in operation late next year. The plant will utilize hydrogen available from the company's huge chlorine plant there in the Haber-Bosch process for anhydrous ammonia. It will employ 1,000 horsepower gas engines for compression of the air and hydrogen. Generally broadening industrial uses for ammonia plus promising agricultural markets led to the company's decision to build the plant.

Construction of a superphosphate fertilizer plant in Pasco, Wash., involving an over-all estimated expenditure of $24 million in six years, is proposed by the Westate Agricultural Chemical Co., newly incorporated Montana organization.

Building work, according to L. Lore Wartes, consulting engineer for the firm, is expected to begin this fall, with an expected initial outlay of $200,000. Negotiations for a plant site, Wartes said, have been completed, assuring the firm possession of an 80-acre tract on the Snake river near its junction with the Columbia. Production of fertilizer is expected to begin next spring.

Construction work has started in Philadelphia on the Marshall Laboratory of the Du Pont Co., named in honor of John Marshall, director of the Chemical Division of the Fabrics and Finishes Department. Scheduled to be completed late next year at a cost of $2 million, the new four-story building will replace laboratory facilities now located in three different buildings on the grounds of the Du Pont finishes plant in Philadelphia.

An enlarged dyestuffs application laboratory will be completed at Cincinnati, Ohio, in the near future by Hilton-Davis Chemical Co. Standardizations of the dyestuffs line manufactured by the company are tested and controlled in the laboratory.

The first phase of A. E. Staley Manufacturing Co.'s $11.5 million modernization program at its Decatur, Ill. food processing plant has been completed. Three new buildings and an expansion of the power house have been completed, and work is continuing on the renovation of the processing equipment. The new building house and single-story first aid and service building, a four-story feed packing house and single-story first aid and hospital building. The H. K. Ferguson Co. is handling engineering and building.

Emil D. Ries, named head of the new department into which the Du Pont Co. has combined its plastics and ammonia departments because of their growing interdependence. Dr. Ries has been general manager of the ammonia department.

The Girdler Corp., Louisville, Ky., has begun construction of a Hygirtol plant for Lever Brothers Co. at Hammond, Indiana. The project is being handled in cooperation with Lever's engineering executives. Girdler's Hygirtol plants use the hydrocarbon-steam process for the production of high purity, low cost hydrogen, and are markedly efficient. The Hygirtol plant is an expansion of Lever's present hydrogen producing facilities.

The American rubber plant operated for the government at Port Neches, Texas by B. F. Goodrich Chemical Co., has begun producing low temperature polymerized GR-S, popularly known as "cold rubber," following the installation of necessary refrigerating equipment. The plant's rated capacity, when in full production, will be 30,000 tons annually.

All of the remaining principal expansion projects now underway at the Lion Oil Co. chemical plant at El Dorado, Ark. were expected to be completed and in operation on or before the first of September, 1949. These projects include a sulphuric acid plant, an ammonium sulphate plant and an ammonium nitrate prilling plant. These latter projects represent an additional capital expenditure of about $3 million apart from the cost of the ammonia plant expansion.

A $2 million glass factory which will manufacture glass parts for incandescent and fluorescent lamps has been completed at Logan, Ohio, for the General Electric Co. by The H. K. Ferguson Co. The plant will employ about 200 persons at peak levels of operation.

The main building, 320 x 500 ft., houses two gas-fired glass furnaces, one for lead glass and one for lime glass. Raw materials are fed into the furnaces by conveying equipment and mechanical feeders from an adjacent mixing room. The glass tubes are made by an automatic horizontal draw process.

Washington

Large-scale purchasing of most chemicals and chemical products for which government specifications exist is being centered in the Army Chemical Center, Maryland.

Provisional allotments totalling $850,000 to states, territories and the District of Columbia for grants to study water pollution resulting from industrial waste have been made by the Federal Security Agency. Before funds may actually be released for study of industrial waste problems, applications setting forth specific programs must be approved by the Public Health Service of the Federal Security Agency. A number of applications already have been received.

A public demonstration run will be made in the experimental oil shale mine near Rifle, Colo., from September 7 through October 4, and James Boyd, Director of the Bureau of Mines, has invited mining engineers, mine equipment makers, oil company representatives, and any other interested persons to be present. The top level will be worked for the first two weeks and the bench level for the following two.

In the month-long test run, unique equipment and practices employed in achieving low-cost volume production will be demonstrated. At the same time, a new determination will be made of the direct costs of mining oil shale. Earlier test runs have achieved direct costs of less than 50 cents a ton and production rates exceeding 100 tons per man shift underground.

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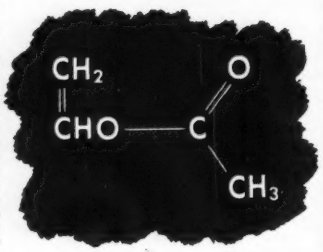

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Foreign Developments

The new Shell Chemical Co.'s solvents plant, opened at Stanlow, Cheshire, recently is the first of its kind in Europe, and of vital technical and economic importance to the future of British industry. From this plant Shell will produce annually some 24,000 tons of chemical solvents. At Stanlow it will crack oil into chemicals suitable for the paint, varnish, perfumery, textile, drug, leather, plastic, film, printing ink, and allied industries. All sorts of insecticides, fungicides, and soil fumigants will be made available. Much of this material had to be imported previously and the development of this new plant will make the sterling area less dependent on the U. S. A.

Monsanto Chemical Co. has changed the name of its Australian associated company to Monsanto Chemicals (Australia) Limited. The company, which was formerly known as Monsanto (Australia) Proprietary Limited, was converted to a public company at a recent meeting of shareholders. At the same meeting, new Articles of Association were prepared to conform to the requirements of the Melbourne Stock Exchange. These were adopted by the shareholders.

CALENDAR *of* EVENTS

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., Oct. 13-15.
AMERICAN COKE AND CHEMICALS INSTITUTE, annual meeting, Skytop Lodge, Skytop, Pa., Oct. 3-5.
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, annual meeting, William Penn Hotel, Pittsburgh, Pa., Dec. 4-7.
AMERICAN OIL CHEMISTS SOCIETY, fall meeting, Edgewater Beach Hotel, Chicago, Oct. 31-Nov. 2.
AMERICAN PETROLEUM INSTITUTE, annual meeting, Chicago, Nov. 7-10.
AMERICAN SOCIETY FOR TESTING MATERIALS, 1st Pacific Area national meeting, Hotel Fairmount, San Francisco, Oct. 10-14.
ASSOCIATION OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS, annual meeting, Sheraton Hotel, New York City, Oct. 25.
DRUG, CHEMICAL AND ALLIED TRADES SECTION, NEW YORK BOARD OF TRADE, 59th annual meeting, Shawnee Inn, Shawnee-on-Delaware, Pa., Sept. 22-25.
ELECTROCHEMICAL SOCIETY, 96th convention, La Salle Hotel, Chicago, Oct. 12-15.
EXPOSITION OF CHEMICAL INDUSTRIES, Grand Central Palace, New York City, Nov. 28-Dec. 3.
FEDERATION OF PAINT AND VARNISH PRODUCTION CLUBS, 27th annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., Nov. 3-5.
NATIONAL LUBRICATING GREASE INSTITUTE, Hotel Roosevelt, New Orleans, La., Oct. 3-5.
NATIONAL FERTILIZER ASSOCIATION, fall meeting, Atlanta-Biltmore Hotel, Atlanta, Ga., Nov. 15-16.
NATIONAL PEST CONTROL ASSOCIATION, Biltmore Hotel, Los Angeles, Cal., Oct. 16-19.
NATIONAL SAFETY COUNCIL, 37th national safety congress and exposition, Chicago, Oct. 24-28.
PACIFIC CHEMICAL EXPOSITION, San Francisco Civic Auditorium, San Francisco, Nov. 1-5.
PACKAGING INSTITUTE, 11th annual forum, Commodore Hotel, New York City, Oct. 24-26.
SCIENTIFIC APPARATUS MAKERS' ASSOCIATION, Laboratory Apparatus Section, mid-year meeting, Broadmoor Hotel, Colorado Springs, Colo., Sept. 28-30.

Company Notes

Chemical companies report the following profits for the six-month period ending June, 1949:

Company	*Net Income After Taxes First Half of 1949*	*1948*
Abbott Laboratories	$5,720,008	.....
Air Reduction Co., Inc.	3,341,758	$3,044,79
American Potash & Chemical Corp.	797,732	941,934
Atlas Powder Co.	791,918	.....
Sterling Drug, Inc.	7,259,322	7,534,573
Celanese Corp. of America	6,174,659	20,768,862
Commercial Solvents Corp.	1,563,757	3,231,582
The Dow Chemical Co.	25,260,473*	21,066,646*
E. I. du Pont de Nemours & Co.	86,806,495	73,111,127
Freeport Sulphur Co.	2,607,130	1,848,802
General Aniline & Film Corp.	2,756,000	3,651,000
Lion Oil Co.	4,693,959	5,719,994
National Lead Co.	6,391,128	6,512,990
Penick & Ford, Ltd., Inc.	838,299	697,317
Phillips Petroleum Co. and subsidiaries	21,953,129	36,481,282
Standard Oil Co. (Indiana) and subsidiaries	50,713,608	66,179,148
Standard Oil Co. of California	75,788,364	77,611,483
Union Carbide and Carbon Corp.	42,126,139	47,061,574

* *For fiscal year ended May 31, 1949.*

Victor Chemical Works has acquired A. R. Maas Chemical Co., South Gate, Cal., a manufacturer of photographic chemicals, phosphoric acid, and sodium phosphates. No change in personnel is contemplated and the present management will continue.

In acquiring Maas, Victor has now increased its producing points to six.

Award of a new high merit rating for safety has been made by the Industrial Commission of Ohio to Hilton-Davis, Cincinnati.

Western Supply Co., Tulsa, has been elected to membership in the Tubular Exchanger Manufacturers Association. T. E. M. A. is a group of manufacturers serving the refining, gasoline and general processing industries. This group is responsible for the development of thermal and mechanical standardization of tubular heat transfer equipment.

The name of New England Alcohol Co., Everett, Mass., a partially-owned subsidiary of Monsanto Chemical Co., has been changed to Nealco-Monsanto Co. The Board of Trustees of Central Aguirre Sugar Co. of Puerto Rico voted to make

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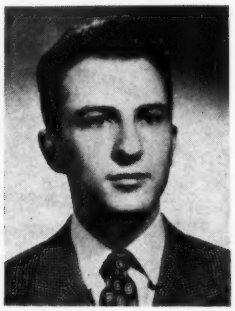
the change at a special meeting. Central Aguirre and Monsanto are partners in the ownership of New England Alcohol Co. The name change was brought about by the desire for a more descriptive name inasmuch as Nealco's operations embrace carbon dioxide in liquid form and as dry ice as well as alcohol.

Headquarters of the Koppers Gas and Coke Division of Koppers Co., Inc., has been moved to Pittsburgh from Kearny, N. J. Pittsburgh provides a centralized location for headquarters of the Division which operates coke oven plants at Kearny, N. J., and St. Paul, Minn., and blast furnaces at Granite City, Ill. With the change, five of the six operating divisions of Koppers will have headquarters in Pittsburgh which also is headquarters for the company as a whole.

A Division of Fire Technology, the first of its kind in the nation, to work scientifically on reducing the toll of human lives and property loss from fire has been established by the Southwest Research Institute of Houston and San Antonio, Tex. The division presently is undertaking fundamental research programs in chemical and physical aspects of fire, combustion and explosions in order to expand scientific knowledge of these phenomena.



Among prize winners receiving awards at the 116th national meeting of the American Chemical Society are (left to right) Irving M. Klotz, Northwestern University, $1000 Eli Lilly & Co. Award in Biological Chemistry; Agnes Fay Morgan, University of California, 1949 Francis P. Garvan Medal honoring women in chemistry; and Henry A. Lardy, University of Wisconsin, $1000 Paul-Lewis Laboratories Award in Enzyme Chemistry.

PERSONNEL

Company Officers

• Thomas H. Casson has been elected vice-president and controller of **U. S. Industrial Chemicals, Inc.** He has served as controller since 1945, having joined the company as general auditor in 1941.

• **The Maneely Chemical Co.** has appointed Henry J. Dougherty as secretary. He has been head of the Real Estate Division of an affiliated company, the John Maneely Co., since 1942.

• L. A. Chichester has retired as assistant secretary and general credit manager of **The Dow Chemical Co.,** and Robert B. Bennett has been named general credit manager.

Mr. Chichester's retirement comes after 31 years of service with the company.

Production

• H. D. McKinley has been appointed works manager of the new degreasing-solvent manufacturing plant being erected

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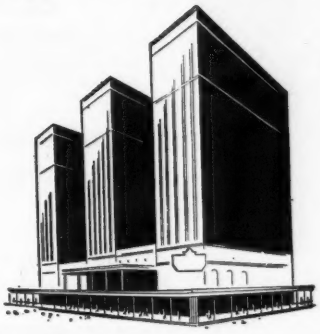

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James R. King (left), who has joined the chemicals department of The Quaker Oats Co., and Col. Charles Lawrence, U.S.A. (retired), new executive secretary of the National Institute of Food Technologists. Mr. King formerly was associated with the Argonne National Laboratory. Col. Lawrence is the institute's first paid executive officer.

• J. Charles Allen recently assumed duties as chief engineer of **Atlas Powder Co.**, succeeding J. W. Hanson, Jr., who has retired. Charles G. Hersh becomes assistant chief engineer, succeeding Mr. Allen.

Sales

• John W. Stevens has been named director of sales of the Chemical Division of **Celanese Corp. of America.** He will be responsible for the sales of organic chemicals produced at the Chemcel plant, Bishop, Texas.

• **Monsanto Chemical Co.** has appointed Tom K. Smith manager of plasticizers and resins sales for its Organic Division, St. Louis, and Seth Shorey sales manager for organic and phosphate division products for the Merrimac Division.

Research

• W. E. Mahin, chairman of metals research at **Armour Research Foundation** of Illinois Institute of Technology, has been named director of research. He will head a group of 411 scientists, engineers, and technicians who are at present working on 125 active research projects for industrial and government sponsors.

• Paul S. Farrington, of the California Institute of Technology, has been chosen as the first recipient of the $2,500 **Merck Graduate Fellowship** in Analytical Chemistry.

Associations

• H. L. Miner, manager, Safety and Fire Prevention Division, E. I. duPont de Nemours & Co., Inc., has been named chairman of the Safety Code Correlating Committee of the **American Standards Association.** The committee is the top technical group in charge of the development of national safety standards of the Association.

• Paul B. Slawter, Jr., vice-president of The House of J. Hayden Twiss, has been appointed director of public relations for the American Section of the **Society of Chemical Industry.**

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CHEMICAL MARKETS

Production Generally Off Among Inorganics

United States production levels of industrially important inorganic chemicals for May 1949 were generally lower than those reported for April 1949 or for May 1948, according to the Bureau of Census, Department of Commerce. Increases above April 1948 quantities were reported for 14 of the 35 chemicals included in the Bureau's continuous monthly survey, while decreases were reported for 19. Fourteen of the 35 chemicals were also produced in larger quantities during May 1949 than during May 1948 and 19 were produced in a smaller volume.

Production of synthetic anhydrous ammonia increased again over the previous month's figures, thus setting a new monthly high for this chemical. The usual seasonal movement was reflected in the May production gains for solid carbon dioxide (dry ice). Other "heavy volume" inorganic chemicals for which May quantities were higher than those for the previous month were chlorine, phosphoric acid and sulfuric acid.

Million Ton Level for U. S. Rubber Consumption

World production of natural rubber in 1949 is now estimated by the U. S. Department of Commerce at 1,535,000 long tons. This figure is 40,000 tons less than the total indicated last April by the International Rubber Study Group in London.

Expected United States consumption of natural rubber this year is now placed at 570,000 long tons, leaving 965,000 tons for consumption in the rest of the world and for inventory adjustments.

In addition, this country probably will consume 410,000 long tons of synthetic rubber of various types, or a total of 980,000 tons of new rubber, in 1949. This figure is 30,000 tons less than the total projected U. S. consumption announced earlier by the Rubber Study Group.

It is expected that manufacture of transportation items (tires, tubes and camelback) will account for 682,000 tons of new rubber in the United States during 1949, and that 298,000 tons will go into other products.

Tax Renewed on Non-P. I. Coconut Oil

The two cents-a-pound processing tax on coconut oil not derived from Philippine copra, which had been suspended, has been re-imposed by presidential proclamation. This action, based on the Philippine Trade Act of 1946 which had continued suspension of the tax (suspension first authorized during the war when the Philippines were cut off) until supplies of copra and coconut oil were readily available for processing in the U. S., is expected to keep the price of coconut oil at present high levels. Coconut oil and copra from non-Philippine sources, now at a 2¢ disadvantage, will effectively be barred from this country.

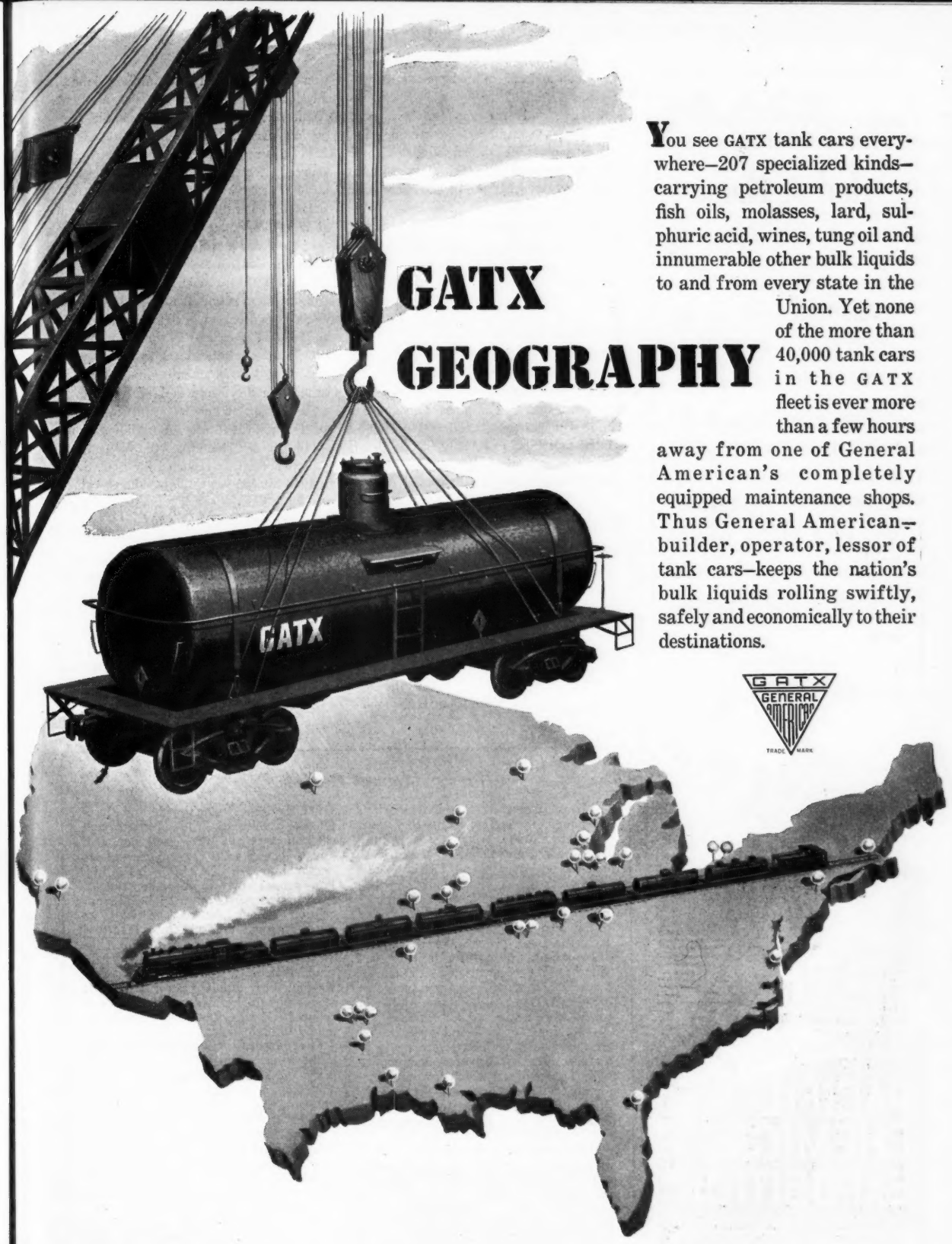
Many in the trade feel that supplies of coconut oil are not adequate, although the President so stated in his proclamation. They point to imports from the Philippines that are far below those received previously because a larger proportion is going to Europe. Since the price of coconut is far out of line with other oils that can be substituted for it, manufacturers have had to shy away from it, and continued high levels are expected to increase this trend.

Continued Growth Trend Of Vinyls

The only clearly defined trend in the vinyl industry is continued growth with the detailed patterns of this growth often obscured, according to David S. Plumb, Monsanto Chemical Co., who recently addressed The Society of the Plastics Industry on this subject. One certain fact, however, is that outside the surface coating field, vinyls represent the biggest single segment of the plastics industry.

In pointing out that vinyl statistics are a subject of dispute primarily because data of vinyl chloride and its copolymers, which are the largest segment of the industry, are combined with the smaller usage vinyl resins in Government statistical reports, Mr. Plumb discussed these complications. The use of vinyl resins is reported in four categories: (1) sheeting and film; (2) textile and paper coating; (3) molding and extrusion; and (4) "all other" which include surface coating adhesives and miscellaneous products not otherwise classified.

The data are complicated in several respects. For example, sheeting and film are reported on a film poundage basis and include vinyl butyral safety glass plastic. All other groups are presumably reported on a net resin basis but include such products as vinyl copolymer victrola records and polyvinyl acetate and polyvinyl alcohol adhesives. Allowing for such factors, 1947 consumption of vinyl chloride and copolymers in resin form is estimated by Mr. Plumb at 140 million pounds, and 1948, at 165 million pounds. This probably represents vinyl-based plastics of



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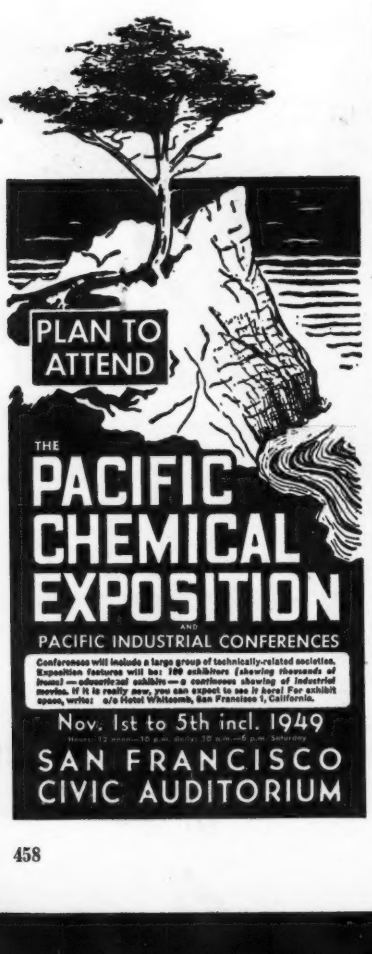

about 200 and 235 million pounds respectively.

Molding and extrusion probably were the largest consumers, accounting for somewhat over 70 million pounds of vinyl chloride products, of which about 60 million were extrusion products. There was little growth between the two years.

Film and sheeting, on the other hand, jumped from an estimated 33 million pounds of resin in 1947 to about 51 million pounds in 1948. This represented overall film poundages of 54 million and 85 million respectively, a 50% increase in one year. An even greater increase was registered by coatings of fabric and paper —from 17 million pounds in 1947 to 30 million pounds in 1948. Although the "all other" classification dropped to about 15 million pounds from 21 million, Mr. Plumb pointed that this is probably the result of changes in reporting which classified the resin in other categories.

Most Tar Crudes Register Production Gains

United States production in 1948 of benzene amounted to 174 million gallons, the second largest output on record, and slightly under the peak production of 178 million gallons in 1944, according to U. S. Tariff Commission preliminary statistics on production and sales of tar and tar crudes. Sales in 1948 totaled 156 million gallons, valued at 30 million dollars. Production of motor benzene in 1948, about 10.5 million gallons, was the lowest on record. Production of toluene in 1948 (more than half from petroleum sources) totaled 83 million gallons—the largest peacetime output ever recorded. Sales of 76 million gallons were valued at 17 million dollars. The output of xylene (chiefly from petroleum sources) was 61 million gallons in 1948.

In 1948 the production of naphthalene (326 million pounds) exceeded the previous record output of 315 million pounds in 1947. Sales totaled 246 million pounds, valued at 13 million dollars, and were somewhat less in quantity but larger in value than they were in 1947.

Production of creosote oil for wood preserving in 1948 was 138 million gallons, or 14 per cent less than the 159 million gallons previously reported for 1947. Sales in 1948 totaled 126 million gallons, valued at 24 million dollars. Production of road tar decreased sharply to 118 million gallons in 1948 from 160 million gallons in 1947—a decline of 26 per cent. Sales were 112 million gallons, valued at 15 million dollars. Production of all tars (coal tar, water-gas tar and oil-gas tar) in 1948 was the largest on record and amounted to 1,022 million gallons compared with 1,005 million gallons in 1947. Sales in 1948 totaled 570 million gallons, valued at 56

(*Turn to page 463*)

Market Review

Most areas in chemical markets continued to suffer from the usual summer dullness. About the only lines that showed any definite pattern were non-ferrous metals and fats and oils, both on the upswing. Although the unusually hot weather accentuated slowness in the early period, there seemed to be a pick-up at the end, particularly for small orders.

Improved demand for lead and zinc brought advances which extended to their derivatives. Separate increases of ¼¢, ½-⅜¢, ¼-½¢, and ¼-½¢ a pound were registered for lead oxides; ½-⅜¢, for the 35% and 50% leaded zinc oxides. Reductions were made in metallic oleates, stearates, and copper hydrate, chemicals which had not completely reflected previous declines in the base metals. Quicksilver continued to drop (to $75 a flask) because of ample supplies and little interest.

Stiffening in fats and oils showed up in higher prices for stearic acid, red oil, olein white, lard oil and tallow oil, acidless—all increased 1¢ a pound. A firm tone prevailed in drying oils, and tung oil, which was very hard to find, went up ¾¢. Linseed oil was very active at the reduced tankcar price of 19.6¢ a pound that was to hold until the end of August.

Spirited demand for pesticide materials, laid in part to late purchasing by consumers, caused shortages of DDT, benzene hexachloride and toxaphene. Stocks of lead arsenate and calcium arsenate were well depleted, and a heavy call for copper sulfate was maintained. The end of the period, however, saw a waning of demand.

Chlorine continued to be the exception among heavy chemicals as good seasonal demand for water and sewage treatment revealed tight conditions in some quarters. This was particularly true of small cylinders which were in short supply. Oxalic acid, with stocks plentiful and demand light, was reduced ¼¢ a pound to 14¼¢ a pound in carload lots.

Increasingly competitive conditions in penicillin led to a cut in bulk price of 5¢ per million units. Both domestic and foreign demand for streptomycin was good. Caffeine was reduced 95¢—$1 a pound because of new facilities and improved production methods. There was a downward movement in botanicals which probably reflected an adjustment to prices for the 1949 crop, lower than last year's.

Citrus oils were still active as conditions in essential oils were mixed. In general, declines seemed to outnumber advances, although there were some significant ones reflecting higher replacement costs. Prospects were considered discouraging in the face of continuation of excise taxes on consumer products.

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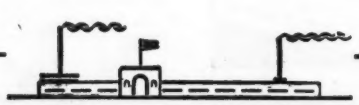

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Should Chemicals Move By Pipeline?

(Continued from page 349)

As can be seen from the rough figures in the table on page 349, full load operation of the three-inch line would transport chemical products for about 1.6¢ per thousand miles—competitive with rail but not competitive with water rates. If more products were available for movement, addition of four additional pumping stations would bring this cost down to about one cent per pound. Thus it is readily apparent that the problem of pipeline transportation is one of finding a sufficiently large volume of products to move from one point to another. Any major transshipment from the pipeline terminus would make rail freight cheaper at the projected rate of operation.

CAUSTIC SODA

There is an excess of caustic soda in the Southwest and a demand for more chlorine without a corresponding demand for caustic (*CI, June 1949, p. 936*), making this large volume product a possibility. The viscosity of caustic solutions is such that they could probably be moved economically at concentrations no higher than 30% in water. As can be seen from the table on page 349, it would cost $15.05 per ton of 100% sodium hydroxide when carrying 182,500 tons per year in a six-inch line for 1000 miles. This tonnage approximates the production of the largest caustic soda plant in the Southwest.

The figure of $15.05 per ton, however, includes nothing to cover cost of distribution to consumers. It could be realized only where nearly all of the caustic soda production from the Southwest's largest producing center could move directly by pipeline to the end user—not a very probable situation.

SUMMARY

Preliminary examination discloses that, although perfectly feasible from a technical standpoint, pipeline transportation of chemicals awaits the development of sufficiently large volumes of production to warrant the huge capital outlay required.

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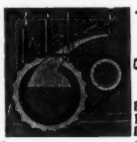

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Chemical Markets

(*Continued from page 458*)

million dollars. About two-thirds of all the tar produced in the United States in 1948 was coal tar, the remainder being largely water-gas tar.

Soap Sales Register Modest Gain

Domestic sales of soap for the second quarter of 1949 were up slightly over first quarter, according to Roy W. Peet, manager of the Association of American Soap & Glycerine Producers, Inc.

Sales Census reports to the Association from 87 manufacturers representing a very substantial portion of the industry's volume show non-liquid soap sales amounting to 626,527,000 pounds as against 614,621,000 pounds from 79 companies in the first quarter. Based on only those companies' reports which make comparisons possible, non-liquid soap sales for the second quarter were 3.6 per cent less than for the second quarter of 1948 but 1.2 per cent above the first quarter of 1949.

Liquid soap sold by 54 companies during the second quarter 1949 amounted to 1,443,000 gallons, compared to 1,331,000 gallons reported by 49 companies for first quarter of 1949. Data from companies reporting each quarter show an 8.9 per cent increase over the second quarter of 1948 and an increase of 5.1 per cent over the first quarter of 1949.

Sales of synthetic detergents in the second quarter of 1949 as reported by 31 companies totaled 158236,000 pounds. For the first quarter of 1949, 26 companies reported 154,871,000 pounds. In the second quarter 1948, 15 companies reported 96,823,000 pounds.

Packaging & Shipping

(*Continued from page 433*)

by vacuum from storage container underneath the filling bench.

Change-over from one size of container to another is a matter of a few moments; from one liquid to another takes only 4 or 5 minutes as the machine is self-cleaning.

New Carton Protects Ampuls

A new carton, called the Rondo, is now being used in this country to safeguard ampuls, important to the medical profession as containers for injectable medicaments, against breakage in transit and storage. Developed in Switzerland about a year ago by Alfred Bossi, it is being manufactured here by his American Rondo Co. National Folding Box Co., Inc., New Haven, Conn., is handling sales.

The new package is so named because of the rounded and undulated form of the paperboard, which holds the glass ampuls firmly suspended above an air pocket for protection. Individual and locking compartments for each ampul are attached to a sleeve which slides in and out of the outer box for convenience in use.

Winthrop-Stearns, Inc., pharmaceutical manufacturers, is now introducing the new carton here for one of its ampul products and expects to package other products similarly.

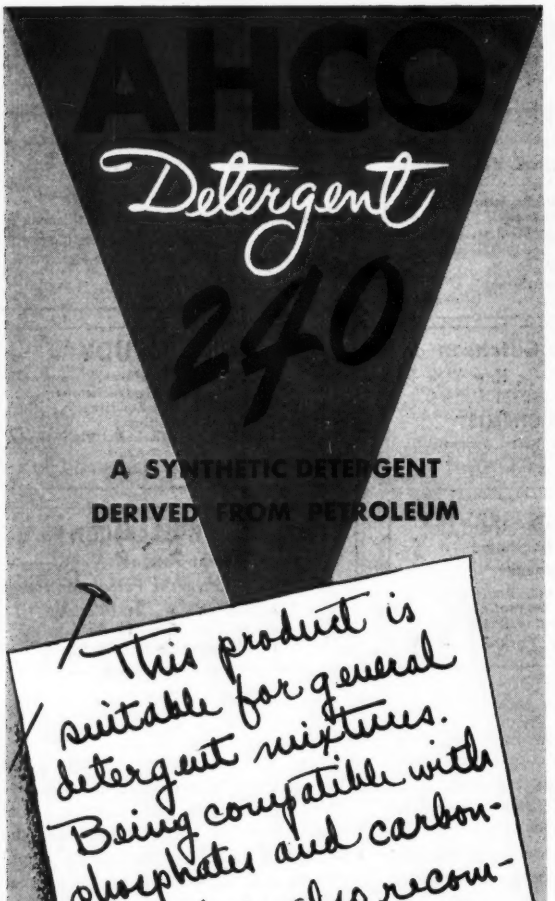
New Size Resin Container

American Cyanamid Co. is now shipping its Aerotex Cream 450 in 50 gallon instead of 55 gallon steel containers. The new size drums, which contain exactly 500 lbs. of resin, have been adopted to simplify accounting procedures for mills and finishers. Since the new drums are non-returnable and no charge is made for them, further simplification in accounting has been made possible.

The new type of drum is not as high as the former package, and tests show that it should be easier to handle. The company plans to expand this policy and in the near future will ship all of its textile resin products in such drums.

MCA Manual on Chlorosulfonic Acid

The Manufacturing Chemists' Association recently has published Chemical Safety Data Sheet SD-33 on Chlorosulfonic Acid. Designed for supervisory staffs and management, it presents essential information for the safe handling and use of this chemical. The manual may be obtained at 20 cents per copy from the Manufacturing Chemists' Association, Washington 5, D. C.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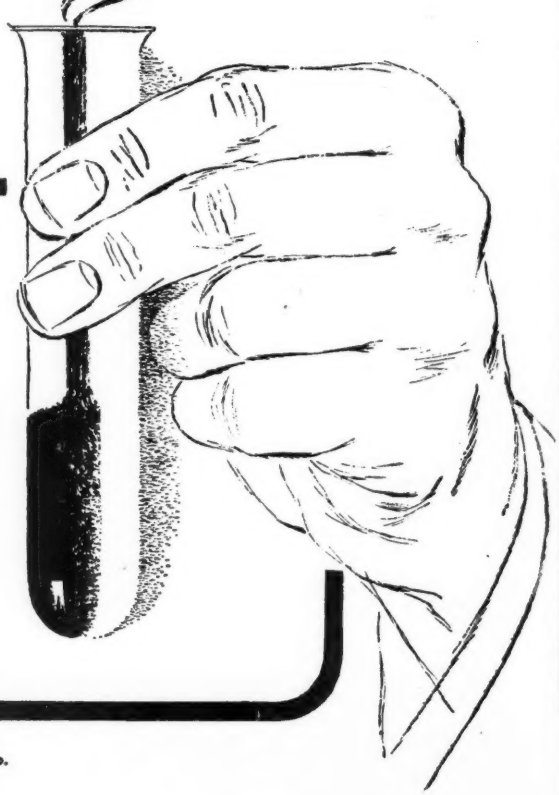

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U. S. Patents from Official Gazette—Vol. 622, Nos. 1, 2, 3, 4, 5, (May 3-May 31)

Inorganic

Producing alumina by calcining a mixture of aluminum hydroxide and boric oxide. No. 2,469,088. Jason F. Thompson (to Aluminum Co. of America).

In producing chlorine dioxide by reacting a metallic chlorate with a gaseous reducing agent, the step of bring the gaseous agent to act upon the chlorate in an aqueous solution acidified by any strong acid, with the exception of halogenic acids. No. 23,111. Torsten Gustaf Holst (to Mo Och Domsjo Aktiebolag).

Producing barium aluminate by mixing sodium carbonate with barium sulfate and alumina, and heating. No. 2,469,413. Paul S. Roller (to U. S. A. by the Secretary of the Interior).

As a gaseous oxygen source, a fused chlorate candle, consisting of an alkali metal chlorate, iron sufficient to maintain the decomposition of the chlorate, and inert filler. No. 2,469,414. William H. Schechter.

Production of elemental silicon by preparing a hot, molten alloy containing aluminum and silicon in admixture with iron and titanium; cooling said alloy; crushing; screening and thereby separating into a relatively coarse fraction substantially free from crystalline silicon and a relatively fine fraction rich in crystalline silicon; depositing the said fine fraction in a body of liquid which is non-reactive therewith and has a specific gravity of about 2.43; and removing floating elemental silicon of high purity from the surface. No. 2,469,418. Marcus M. Striplin, Jr. (to Tennessee Valley Authority).

Siliceous magnesium-containing purifying medium. No. 2,469,512. John J. Naugle.

Preparing boron compounds by effecting reaction between a boron halide and hydrogen while the said reactants are in contact with a mass containing an electropositive metal selected from the class consisting of the alkali metals, the alkaline-earth metals, magnesium, zinc and aluminum. No. 2,469,879. Dallas T. Hurd (to General Electric Co.).

Production of calcium hypochlorite by chlorination of a basic aqueous mixture containing calcium ions. No. 2,469,901. Jerome W. Sprauer (to Pennsylvania Salt Mfg. Co.).

In a liquid phase process for preparing uranium tetrabromide, the steps comprising refluxing a reaction mixture containing a uranium oxide, sulphur and bromine so that sulfur bromide is formed and sulfur dioxide is given off. No. 2,469,916. James M. Carter (to U. S. A. by the U. S. Atomic Energy Commission).

Composite phosphor screen comprising a layer of magnesium orthogermanate and manganese activator and a second layer of magnesium germanate of greater magnesium oxide content, said last-mentioned germanate containing a radio active material. No. 2,470,173. Humboldt W. Leverenz (to Radio Corp. of America).

Composition of matter consisting of liquid hydrogen fluoride having dissolved therein, a substantially nonoxidizing compound soluble in liquid hydrogen fluoride and selected from the group consisting of the acids of phosphorus and their anhydrides and esters. No. 2,470,175. Carl B. Linn (to Universal Oil Products Co.).

Soda lime rendered dust free by the incorporation of a polymeric material selected from the class consisting of natural rubber, polyisoprene, copolymers of butadiene and styrene, polychloroprene, and polyvinylidene chloride. No. 2,470,214. Charles H. Egan (to Dewey and Almy Chemical Co.).

Producing a complex chromium ammonium chloride for electrolytic deposition of chromium metal by converting potassium bichromate in the presence of hydrochloric acid by specific reduction agents comprising zincs of the solid and mossy or porous type to a bivalent chromium chloride compound, converting said bivalent chromium chloride into a bivalent chromium acetate, separating by washing and filtration and oxidizing said bivalent compound to a trivalent complex chromium in reaction with ammonia, ammonium chloride and water and separating the ammonium chloride crystals from the product. No. 2,470,378. Ljubomir W. Skala (60% to M. M. Warner and 10% to Henry Blech).

Compound phosphor consisting of calcium phosphate, a cerium activator therefor, a radium compound intermingled with said calcium phosphate and a coating of magnesium-germanate material with manganese activator having greater magnesium oxide content than ortho proportions. No. 2,470,449. Ferd E. Williams (to Radio Corp. of America).

Phosphor material consisting of crystallized zince sulphide and activators of copper, manganese and terbium. No. 2,470,451. Elton J. Wood (to Radio Corp. of America).

Improving the adsorbing efficiency of a magnesium silicate adsorbent which comprises removing color-imparting bodies from said adsorbent, and then subjecting said adsorbent to intimate contact with an aqueous solution containing magnesium ions to still further improve the adsorbing efficiency. No. 2,470,486. Russell J. Hawes (to Tide Water Associated Oil Co.).

Phosphor material consisting of zinc fluoride crystallized with cadmium and manganese activator per mole of zinc fluoride. No. 2,470,627. Humboldt W. Leverenz (to Radio Corp. of America).

Catalyst mass comprising a coherent mixture containing as essential active constituents amorphous carbon, at least one hydroxide of the group consisting of the hydroxides of magnesium, calcium, strontium, barium and beryllium, and at least one material of the group consisting of alkali hydroxides and carbonates. No. 2,470,688. Austin George Carter (to American Magnesium Metals Corp.).

Production of coarse granular potassium chloride by crystallizing the potassium chloride from a hot saturated solution through cooling a nuclei formation retarding agent being added to the solution before crystallization, selected from the class consisting of oxides and salts of iron, aluminum, thorium, zinc, bismuth and lead. No. 2,470,822. Arthur Kenneth Johnson and Henry B. Suhr (to American Potash & Chemical Corp.).

Ammonia recovery in soda ash production. No. 2,471,013. John Ross Taylor (to Richard Kellogg Wurtele).

Manufacture of sulfuric acid. No. 2,471,072. Henry F. Merriam (to Allied Chemical & Dye Corp.).

Luminescent material consisting of calcium cadmium silicate, activated by maganese and lead. No. 2,471,082. James H. Schulman (to Sylvania Electric Products, Inc.).

Producing hydrochloric acid gas and iron oxide from iron chloride by heating, agitating and grinding in a rotatory kiln in the presence of air and water by a stream of heated balls and thereby decomposing said iron chloride into iron oxide. No. 2,471,844. Samuel Strelzoff (to Chemical Construction Corp.).

Production of thionyl chloride by subjecting carbon monoxide, sulfur dioxide and chlorine to successive zones of activated carbon catalysts. No. 2,471,946. Edwin F. Fricke (to Allied Chemical & Dye Corp.).

Leather

Tanning composition comprising an interpolymerization product of quinone and resorcinol, containing a water-soluble, boron-oxygen compound selected from the group consisting of boric acid and an alkali borate. No. 2,469,428. Harold C. Beachell (to E. I. du Pont de Nemours & Co.).

Quinone-resorcinol tanning agent. No. 2,469,437. Joseph S. Kirk (to E. I. du Pont de Nemours & Co.).

Quinone-resorcinol tanning agent. No. 2,469,438. Joseph S. Kirk (to E. I. du Pont de Nemours & Co.).

Process of soaking hides with a sulfonated phenol-formaldehyde condensation product. No. 2,469,787. Carl Riehs; (vested in the Attorney General of the U. S.).

Tanning with free formaldehyde and melamine simultaneously. No. 2,470,450. Wallace Windus (to John R. Evans & Co.).

Preserving tanned leather which comprises treating vegetable tanned leather with an aqueous solution of oxalic acid and then with an aqueous solution of a calcium salt to precipitate calcium oxalate therein. No. 2,471,022. Arthur Cheshire (to Richard Hodgson and Sons Ltd.).

Metals

Froth flotation of sulfide ores with phenyl-imido-amyl-dithio-carbonate. No. 2,469,368. Roberto Carvajal and Juan Jose Quiroga (to Kennecott Copper Corp.).

Selective flotation of chromite ores. No. 2,469,422. Arthur J. Weinig.

Nickel plating composition comprising a nickel compound selected from the group consisting of nickel sulfate, nickel chloride, and mixtures of nickel chloride and nickel sulfate, and a sultone. No. 2,469,727. Raymond A. Hoffman (to E. I. du Pont de Nemours & Co.).

Obtaining aluminum as a distillate from material bearing the same, which comprises evaporating a halide of the class consisting of fluoride, chloride and bromide, contacting and reacting the halide vapour in an unsaturated condition with said material to volatilize the aluminium by a strongly endothermic reaction as unstable aluminum halogen compound vapours, and converting said unstable vapours into aluminium and a stable halide by cooling to condense aluminium in the metallic state. No. 2,470,305. Philipp Gross (to International Alloys Ltd.).

Distilling a normally non-volatile metal from material bearing the same, which comprises reacting at elevated temperatures the metal contained in the material with the vapour phase of a reacting halogen containing substance to vapourize the said metal by a strongly endothermic reaction as its unstable lower halide, and converting said lower halide into the metal and a stable halide by condensation of the metal to recover the metal therefrom. No. 2,470,306. Philipp Gross (to International Alloys Ltd.).

Flux composition for use in welding aluminum consisting of lithium fluoride, sodium fluoride, and calcium fluoride. No. 2,470,763. Dorris Monell Doyle.

In smelting titaniferous iron ore with carbon and added flux consisting essentially of a basic oxide of the group consisting of calcium oxide and magnesium oxide, the improvements which consist in proportioning the charge to produce a slag consisting of titanium oxide, basic oxides and incidental impurities, and smelting at between 1550° C. and 1700° C. to produce molten iron and a fluid, titanium-rich, slag. No. 2,471,242. Percy H. Royster (to Pickands Mather & Co.).

Froth flotation of apatite using calcium silicate. No. 2,471,341. Samuel Payne Moyer (to American Cyanamid Co.).

Obtaining concentrates of uranium and vanadium from their ores. No. 2,471,345. Ralph D. Nye and Dana J. Demorest.

In the beneficiation by froth flotation of a metallic sulfide mineral by a promoter selected from the group consisting of the xanthate, dithiophosphoric acids and dithiophosphate types, the improvement which comprises carrying out the separation in the presence of a surface-modifying agent which comprises a salt of a lignin sulfonate. No. 2,471,384. Robert B. Booth and Roy A. Pickens (to American Cyanamid Co.).

Concentrating a cassiterite mineral mixture which comprises, forming a thick pulp, heating, agitating the heated pulp in the presence of a higher fatty acid collector reagent, adding unheated liquid, and thereafter selectively separating the filmed mineral from the gangue. No. 2,471,414. John Dasher and James E. Norman.

Recovery of silver by firing a residue obtained by passage of chlorobenzene over a contact mass comprising silver and silicon in an atmosphere free of oxidizing agents, treating the fired residue with concentrated nitric acid removing the undissolved portions from the nitric acid solution, adding hydrochloric acid to the liquid nitric acid solution to precipitate silver chloride, and recovering the precipitated silver chloride. No. 2,471,824. Herman A. Liebhafsky and Lester B. Bronk (to General Electric Company).

Coating aluminum consisting in treating the metal with an acid aqueous solution the essential, active, coating-producing ingredients of which

are fluoride ion, dichromate ion, arsenate ion and hydrogen ion. No. 2,471,909. Frank Palin Spruance, Jr. (to American Chemical Paint Co.).

In electrodepositing bright copper, the step which comprises electrolyzing an aqueous alkaline coper cyanide solution and a minor proportion of a soluble acyl thiophene. No. 2,471,918. Karl S. Wilson and David G. Ellis (to Harshaw Chemical Co.).

In precipitating cobalt from electrolytes used in the electrolytic refining of zinc, the steps which comprise adding antimony and removing cobalt from the electrolyte. No. 2,471,952. Dinsmore Laurence Griffith and Mavis Jean Rankin (to Hudson Bay Mining and Smelting Co., Ltd.).

Electrolytically producing zinc of high purity from a zinc sulphate electrolite containing at least one of the impurities lead, copper, cadmium and iron, by adjusting the pH to substantial equilibrium neutrality, adding cresylic acid and pine oil, and passing electric current from an impure zinc anode to a cathode to deposit said zinc of high purity. No. 2,471,965. Sherwin Pope Lowe, George William Long, George Henry Kent and Kenneth William Downes (to Hudson Bay Mining and Smelting Co., Ltd.).

Organic

Preparation of a monohydric alcohol ester of beta-thiodipropionic acid, the alcohol containing 10 to 24 carbon atoms, by heating a lower dialkyl ester of beta-thiodipropionic acid with a monohydric alcohol containing 10 to 24 carbon atoms in the presence of an acid catalyst. No. 2,468,725. William F. Gresham and Myers F. Gribbins (to E. I. du Pont de Nemours & Co.).

Condensation of olefinic compounds with hydrogen sulfide. No. 2,468,739. John L. Eaton and John B. Fenn (to Sharples Chemicals Inc.).

Fatty acid amine salt composition. No. 2,468,755. Charles W. Hoerr (to Armour and Co.).

In manufacture of vinyl naphthalene the steps of acting upon ethyl naphthalene with oxygen in the presence of an oxidation catalyst to obtain a mixture of methyl naphthyl carbinol and methyl naphthyl ketone, acting upon the thus obtained mixture with hydrogen in the presence of a hydrogenation catalyst to reduce the methyl naphthyl ketone to methyl naphthyl carbinol, and heat the methyl naphthyl carbinol to dehydrate it to vinyl naphthalene. No. 2,468,759. Robert Johnson (to Koppers Co., Inc.).

Acylating phenyl alkyl ethers by reacting with an acylating agent selected from the group consisting of acyl halides of carboxylic acids and anhydrides of carboxylic acids in the presence of iodine. No. 2,468,762. Alvin I. Kosak and Howard D. Hartough (to Socony-Vacuum Oil Co., Inc.).

Making a mixture of amylenes rich in isopropylethylene by dehydrating isoamyl alcohols. No. 2,468,764. Pierre Alfred Laurent (vested in the Attorney General of the U. S.).

Hydrogenating fat with a nickel catalyst. No. 2,468,799. Norbert W. Ziels and Werner H. Schmidt (to Lever Brothers Co.).

Preparation of 7-bromo-derivatives of carboxylic acid esters of cholesterol. No. 2,468,859. Austin Ernest Bide, Ralph John Nicholls and Peter Alfred Wilkinson (to Glaxo Labs. Ltd.).

Production of chloral alcoholate by chlorinating ethyl alcohol in a continuous manner. No. 2,468,861. Walter Bridge and James Matchet (to Imperial Chemical Industries Ltd.).

Manufacture of 3-tetrahydrofuranone by heating 2-butine-1, 4-diol with a mercury salt of an amide. No. 2,468,881. Alan Woodworth Johnson (to Imperial Chemical Industries Ltd.).

Disposal of hydrogen sulfide and the simultaneous production of carbon bisulfide comprising reacting hydrogen sulfide with a hydrocarbon in the fluid state and sulfur dioxide in the presence of a catalyst. No. 2,468,904. Cary R. Wagner (to Phillips Petroleum Co.).

Alkyl esters of α-acyl, α-acylamino, β(3-indole)-propionic acid. No. 2,468,912. Noel F. Albertson, Sydney Archer and Chester M. Suter (to Winthrop-Stearns, Inc.).

Producing a glycerin-titanium compound by mixing precipitated, hydrated orthotitanic acid with glycerin and digesting. No. 2,468,916. James Eliot Booge and Hugh Clifton Gulledge (to E. I. du Pont de Nemours & Co.).

Thiamine 2-ethylhexyl sulfate. No. 2,468,930. Wolfgang Huber and Werner R. Boehme (to Winthrop-Stearns Inc.).

Preparation of di-thiazyl disulfide. No. 2,468,952. Adolph J. Beber (to B. F. Goodrich Co.).

Composition of matter comprising carbon black and alkyl thiazyl disulfides. No. 2,468,978. Arthur L. Hollis (to B. F. Goodrich Co.).

In a process wherein a phenol is condensed with a carbonyl compound containing oxygen in carbonyl linkage in an acidic medium, the step which comprises carrying out the condensation in the presence of a catalyst selected from the class consisting of mercapto-substituted aliphatic carboxylic acids and the mercaptols and mercaptals of such mercapto-acids. No. 2,468,982. Jacob Eden Jansen (to B. F. Goodrich Co.).

Producing liquid oxidized compounds containing at least one olefine group, by heating an oily liquid from the group consisting of olefinic unsaturated higher fatty acids and their glyceride esters with selenium dioxide. No. 2,469,059. Amos Turk (50% to Paul D. Boone).

Recovery of aconitic acid from sugarcane juice by treating with lime. No. 2,469,090. Emil K. Ventre (to U.S.A. by the Secretary of Agriculture).

Preparing β-lactones. No. 2,469,110. Hugh J. Hagemeyer, Jr. (to Eastman Kodak Co.).

An unsaturated organic sulfur-containing product derived from the interaction in an aqueous emulsion of conjugated butadiene, an unsaturated organic comonomer polymerizable therewith in aqueous emulsion selected from the group consisting of styrene, acrylonitrile, and methyl methacrylate and an aliphatic mercaptan. No. 2,469,132. Walter A. Schulze and Willie W. Crouch (to Phillips Petroleum Co.).

Recovery of oil and by-products from alcoholic solutions of oleaginous materials. No. 2,469,147. Arthur C. Beckel and Paul A. Belter (to U.S.A. by the Secretary of Agriculture).

Producing Vinylphenyltrihalosilanes by pyrolyzing a silane whose molecule consists of a silicon atom to which are attached three halogens, and one (haloethyl) phenyl radical. No. 2,469,154. Raymond H. Bunnell and David B. Hatcher (to Libbey-Owens-Ford Glass Co.).

Preparing tetrachlorodifluoroethane subjecting a mixture of ethylidene fluoride and chlorine to actinic radiation and heat to form tetrachlorodifluoroethane. No. 2,469,290. John D. Calfee and Patrick A. Florio (to Allied Chemical & Dye Corp.).

Preparing a guanidine phosphate by reacting urea with phosphorus pentoxide. No. 2,469,338. Johnstone S. Mackay (to American Cyanamid Co.).

Reacting an alkyl halide, in which the alkyl radical contains a plurality of carbon atoms, with an inorganic halosilane consisting of hydrogen, halogen, and silicon atoms and having both hydrogen and halogen atoms attached directly to the silicon atom. No. 2,469,355. Lee De Pree and Arthur J. Barry and Donald E. Hook (to Dow Chemical Co.).

Preparations of hydrazonitriles from azines of butyl ketones with hydrogen cyanide. No. 2,469,358. Witty Lysle Alderson, Jr. and James A. Robertson (to E. I. du Pont de Nemours & Co.).

Reacting an ester of a monobasic, hydroxy fatty acid and of a straight chain alcohol, said alcohol having not more than two hydroxyl groups per molecule with a boron compound chosen from the group consisting of boric acid, boric anhydride, metallic borates, and the sulfate, pyrosulfate, halides, and acetate of boron to increase the unsaturation of the ester. No. 2,469,370. Ivor M. Colbeth (to Baker Castor Oil Co.).

Preparation of partial esters of polyhydric alcohols and higher fatty acids, by reacting a neutral fatty oil with methyl alcohol in the presence of an esterification catalyst, further reacting the thus formed mixture of glycerine and methyl esters of fatty acids with added polyhydric alcohol by heating the entire reaction mixture until the methyl esters are converted to partial esters of the polyhydric alcohol component and the free methyl alcohol is distilled off. No. 2,469,371. Ivor M. Colbeth (to Baker Castor Oil Co.).

Preparation of dinitroparaffins by contacting a pseudonitrole with nitrogen tetroxide. No. 2,469,396. John H. McCracken and George S. Crandall (to Socony-Vacuum Oil Co., Inc.).

Hydroxyaryl alicyclic carboxylic acids. No. 2,469,415. Erwin Schwenk and Domenick Papa (to Schering Corp.).

Neutral mixed esters of a fully esterified polyalkylene glycol taken from the class consisting of ethylene and propylene glycols with a mixture of fatty acids consisting of caprylic and capric acids and the remainder of said acids being lauric and caproic. No. 2,469,446. Frank A. Strauss (to E. F. Drew & Co., Inc.).

Reacting a mineral acid salt of 2-methyl-3-hydroxy-4 : 5-dihydroxy-methyl-pyridine with potassium permanganate in aqueous solution and recovering the lactone of 2-methyl-3-hydroxy-4-carboxy-5-hydroxy-methyl-pyridine. No. 2,469,554. Dorothea Heyl (to Merck & Co., Inc.).

Producing beta lactones by condensing a ketene with a compound containing a caronyl group. No. 2,469,690. Hugh J. Hagemeyer, Jr. and Delmer C. Cooper (to Eastman Kodak Co.).

Nitroaminobenzene ester compounds. No. 2,469,695. James G. McNally and Joseph B. Dickey (to Eastman Kodak Co.).

Preparing a 2-chlorobenzothiazole by reacting 2-mercaptobenzothiazole with at least 6 molecular proportions of sulfuryl chloride (SO_2Cl_2). No. 2,469,697. Neil S. Moon (to Eastman Kodak Co.).

In preparing acrylic acid by dehydration of hydracrylic acid, the steps which comprise adding the hydracrylic acid to an acid dehydration catalyst to form an aqueous solution of acrylic acid and distilling off the aqueous acrylic acid. No. 2,469,701. Bryan C. Redmon (to American Cyanamid Co.).

In production of an alkyl halide wherein an olefine and a hydrogen halide are passed into a mixture of a catalyst containing a metal halide of the class consisting of aluminum chloride, aluminum bromide, ferric chloride and ferric bromide, and a non-reactive organic liquid, the improvement which consists in curtailing foaming during the reaction by adding a minor amount of sulphur. No. 2,469,702. Clare C. Schwegler and Frank M. Tennant (to Dow Chemical Co.).

Producing beta butyro lactone by condensing ketene with acetaldehyde. No. 2,469,704. Herbert G. Stone (to Eastman Kodak Co.).

Composition of improved stability comprising an aromatic mono-amine containing a small but stabilizing amount of an aromatic biguanide. No. 2,469,745. Anthony E. Robertson (to Standard Oil Development Co.).

Obtaining alkyl thiophenes by contacting one of the group thiophene and thiophene derivatives having at least one hydrogen atom of the thiophene nucleus replaceable, with an alkylating agent in the presence of boron trifluoride. No. 2,469,823. Rowland C. Hansford and Philip D. Caesar (to Socony-Vacuum Oil Co., Inc.).

Methylol dithionaphthoates. No. 2,469,824. Albert F. Hardman (to Wingfoot Corp.).

Beta-cyano vinyl acetic acid esters. No. 2,469,836. Charles R. Milone (to Wingfoot Corp.).

Sulfolanyl carbamates. No. 2,469,838. Rupert C. Morris and Robert M. Horowitz (to Shell Development Co.).

Preparation of fluorohydrocarbons. No. 2,469,848. Leroy Frank Salisbury (to E. I. du Pont de Nemours & Co.).

Production of heavy metal nicotine silicates. No. 2,469,868. Frederick E. Dearborn.

Production of water repellent heavy metal nicotine silicates. No. 2,469,869. Frederick E. Dearborn.

Cyclopentano perhydrophenanthrene compounds. No. 2,469,967. Emil Kaiser and Jerry Svarz (to Armour & Co.).

Manufacture of 2 : 5 dimethylfuran which comprises subjecting hex-3-en-5-yn-2-ol to the action of heat in the presence of an inorganic mercuric catalyst. No. 2,470,070. Ian M. Heilbron and Ewart R. H. Jones.

Phenylethyl sulfones. No. 2,470,077. John K. Fincke (to Monsanto Chemical Co.).

Alkylene oxide condensation products of dimerized fatty acid alkylol amides. No. 2,470,081. Jack T. Thurston and Ruth B. Warner (to American Cyanamid Co.).

Alpha-alkoximino acid chloride. No. 2,470,083. Walter H. Hartung.

Substituted alpha-halogen alkyl tetrazoles. No. 2,470,084. Edward K. Harvill and Robert M. Herbst (to E. Bilhuber, Inc.).

Substituted amino alkyl tetrazoles. No. 2,470,085. Edward K. Harvill and Robert M. Herbst (to E. Bilhuber, Inc.).

Purifying crude monofluorodichloromethane contaminated with acidic substances, which comprises passing the crude monofluorodichloromethane through and in intimate contact with an aqueous solution of sodium sulfite. No. 2,470,088. Anthony F. Benning, Robert C. McHarness and William S. Murray (to Kinetic Chemicals, Inc.).

In dehydrogenating hydrocarbons over a catalyst in the presence of water, reducing the water vapor induced catalyst induction period, by passing the mixture into contact with a catalyst containing alumina impregnated with nickel. No. 2,470,092. Ben Bennett Corson and George Arthur Webb (to Koppers Co., Inc.).

Diphenylamine compounds. No. 2,470,095. Joseph B. Dickey and James G. McNally (to Eastman Kodak Co.).

2-alkyl-9-(alkoxy-phenyl)-alkoxy-dihydro-1-pyridindene. No. 2,470,108. John Thomas Plati and Wilhelm Wenner (to Hoffmann-La Roche, Inc.).

Compound selected from the group consisting of a 2-alkyl-9-phenyl-dihydro-1-pyridindene, the corresponding hydrogenated compounds, and the salts. No. 2,470,109. John T. Plati and Wilhelm Wenner (to Hoffmann-La Roche, Inc.).

Producing a stable dispersion containing polyethylene polysulfide particles in an aqueous medium by preparing an aqueous reaction mixture containing in addition to the aqueous medium only an ethylene dihalide, a water-soluble polysulfide and a lignin sulfonate. No. 2,470,115. William D. Stewart (to B. F. Goodrich Co.).

Separating the components of a binary eutectic composed of alpha- and beta-ethyl naphthalene with betanaphthol. No. 2,470,116. Wojciech Swietoslawski and John R. Anderson (to Koppers Co., Inc.).

In recovering alcohol from an aqueous mixture of alkyl sulfates and sulfuric acid, by distillation of the mixture to remove alcohol therefrom and wherein polymers, tars, and free carbon are formed as a result of the distillation, the improvement which comprises carrying out such distillation in the presence of a small amount of a hydrocarbon oil which

is non-volatile under the distillation conditions and which is a flux for the polymers, carbon, tars, etc. No. 2,470,206. Francis M. Archibald (to Standard Oil Development Co.).

Isobutylene extraction with sulfuric acid. No. 2,470,207. Bowman S. Garrett (to Standard Oil Development Co.).

Purifying an oxygen-containing organic compound having substantial solubility in water in a crude aqueous liquid mixture contaminated by organic impurities having less solubility in water, which comprises distilling from said mixture a low boiling distillate of said compound with water and impurities, combining a water immiscible organic liquid with said impurities, extracting the compound to be purified from said solution with water, returning the resulting water extract to said distillation zone, and withdrawing the compound to be purified. No. 2,470,222. John A. Patterson (to Standard Oil Development Co.).

Continuous method of chlorinating benzene to produce maximum amounts of monochlorbenzene and minimum amounts of polychlorbenzene. No. 2,470,336. Austin S. Brunjes and Marcel J. P. Bogart (to Lummus Co.).

Cyclopropyl furyl propenone. No. 2,470,349. James W. Hansen and Carroll C. Cassil (to Calif. Spray-Chemical Corp.).

Purifying pteroylglutamic acid and related compounds. No. 2,470,490. Brian L. Hutchings (to American Cyanamid Co.).

Separating the zinc salt of pteroylglutamic acid from related pterins by preparing a solution of a soluble zinc salt and pteroylglutamic acid, separating the insoluble matter, adjusting the pH and separating insoluble zinc pteroylglutamate. No. 2,470,491. Brian L. Hutchings (to American Cyanamid Co.).

Condensing a fatty acid halide having the general formula RCOCl in which R represents an aliphatic hydrocarbon group having more than 10 carbon atoms, with an aromatic acid halide having the general formula ArCOCl, in which Ar represents an aromatic hydrocarbon nucleus. No. 2,470,504. Eugene Lieber and Aloysius F. Cashman (to Standard Oil Development Co.).

Organosiloxanes and methods of making them. No. 2,470,562. James Franklin Hyde (to Corning Glass Works).

Hydrochloric acid addition product of 2-thioureido-4-methyl thiazole. No. 2,470,585. Russell L. Sperry (to American Cyanamid Co.).

Carboxythiophanes. No. 2,470,739. Bernard R. Baker (to American Cyanamid Co.).

Producing a 10,11-dihydro-7-R-phenanthro-[2,1-d] isoxazole, in which R is a member of the class consisting of hydrogen and lower alkoxy groups and lower aralkoxy groups, which consists in treating a 1-keto-2-hydroxy-methylene-7-R- 1,2,3,4-tetrahydrophenanthrene with hydroxylamine. No. 2,470,777. William S. Johnson, Jack W. Petersen and Carl David Gutsche (to Wisconsin Alumni Research Foundation).

Separation of hydroxy organic acids by dissolving a mixture of salts of hydroxy organic acids in a concentrated solution of a highly soluble salt of a metal forming a highly soluble chloride and an insoluble salt of the organic acid to form a metal salt of such organic acid which is soluble in a concentrated solution but insoluble in a dilute solution of said highly soluble metal salt, diluting the solution with ensuing precipitation of said metal salt, removing precipitated salt, converting the unprecipitated organic acids into insoluble basic salts by reaction with an alkaline hydroxide, removing basic salts so produced, and converting them into the corresponding acids through treatment with an inorganic acid. No. 2,470,841. William E. Barch (to Standard Brands Inc.).

Obtaining useful products from the non-volatile by-product acid mixture obtained in the manufacture of sebacic acid by treatment of a member of the group consisting of castor oil and esters and salts of ricinoleic acid with an alkali by contacting said acid mixture under extraction and hydrolyzing conditions with an aqueous mixture of a water-soluble lower aliphatic alcohol. No. 2,470,849. William E. Hanson (to Gulf Research & Development Co.).

Liquid alkanoic acid of the formula $CH_3C(CH_3)_2CH_2CH(CH_3)CH_2COOH$. No. 2,470,859. Albert A. Pavlic (to E. I. du Pont de Nemours & Co.).

Preparing aliphatic carboxylic acids which comprises hydrolyzing a sulfurized tertiary mono-olefine of the formula $C_nH_{2n-4}S_3$, wherein n represents an integer from 4 to 16, in an aqueous alkaline solution, and recovering an aliphatic carboxylic acid from the resulting hydrolysis product. No. 2,470,876. Roderick S. Spindt and Donald R. Stevens (to Gulf Research & Development Co.).

Recovery of sulfonic acids from spent sulfonating agent with water. No. 2,470,896. Julian M. Mavity (to Universal Oil Products Co.).

In the catalytic alkylation of phenols wherein there is formed a catalyst phase containing dissolved mono-alkylated phenol and unreacted phenol, the improvement which comprises removing said catalyst phase from the alkylating zone and extracting the mono-alkylated phenol by contacting the catalyst phase with a selective solvent selected from the group consisting of paraffinic hydrocarbons and chlorinated paraffinic hydrocarbons. No. 2,470,902. Robert H. Rosenwald (to Universal Oil Products Co.).

Production of salts of amino methionic acid. No. 2,471,018. Michael Henry Miller Arnold and William Eric Perry (to Imperial Chemical Industries Ltd.).

Synthesis of 4-hydroxycoumarins. No. 2,471,047. Mark A. Stahmann and Karl Paul Link (to Wisconsin Alumni Research Foundation).

Converting a cyclic sulfone to the corresponding saturated cyclic sulfide, said sulfone being selected from the group consisting of sulfolanyl compounds and 2-sulfolenyl compounds, which method comprises contacting said sulfone with an excess of hydrogen in the presence of a hydrogenation catalyst. No. 2,471,077. Robert J. Moore and Robert A. Trimble (to Shell Development Co.).

The hexamethylenetetramine salt of 3-thenyl bromide. No. 2,471,090. Ernest E. Campaigne and William M. Le Suer (to Indiana University Foundation).

3-thenyl bromide. No. 2,471,091. Ernest E. Campaigne and William M. Le Suer (to Indiana University Foundation).

Preparation of 3-thenaldehyde by steam-distilling a water solution of a quaternary methyleneamine salt of 3-thenyl bromide. No. 2,471,092. Ernest E. Campaigne and William M. Le Suer (to Indiana University Foundation).

3,3′-thenoin. No. 2,471,093. Ernest E. Campaigne and William M. Le Suer (to Indiana University Foundation).

Nitroalkyl sulfites. No. 2,471,274. Shirley P. Lingo (to Commercial Solvents Corp.).

Preparation of a diester of a 1,3-alkanediol with a saturated, lower aliphatic monocarboxylic acid, comprising subjecting a triester of a 1,1,3-alkanetriol with a saturated, lower aliphatic monocarboxylic acid in the presence of a base metal hydrogenation catalyst to the action of hydrogen to produce principally, the ester of the monocarboxylic acid with the 1,3-alkanediol containing the same number and arrangement of carbon atoms as said 1,1,3-alkanetriol. No. 2,471,391. Curtis W. Smith (to Shell Development Co.).

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Removing gummy materials from crude fatty material which comprises mixing said fatty material with liquefied normally gaseous hydrocarbon to dissolve the fatty material and precipitate gummy material, and separating. No. 23,118. Frederick J. Ewing (to Refining, Unincorp.).

Composition of matter consisting of an oil-soluble drier metal salt and a lesser amount of an alkyl acid phosphate wherein the alkyl group embodies not more than 8 carbon atoms. No. 23,119. Alfred Fischer (to Nuodex Products Co., Inc.).

In the preparation of sodium 1-naphthylamine-2-sulfonate from sodium naphthionate, the improvement which comprises heating sodium naphthionate in an inert, neutral, water-immiscible, volatile, organic solvent selected from the class consisting of benzene, and the alkyl and halogen substituted benzenes. No. 2,471,400. Robert Carland Conn and Robert Herbert Weiss (to American Cyanamid Co.).

Preparing a terpene-substituted phenol by reacting a menthene and a phenol in the presence of substantially anhydrous hydrogen fluoride. No. 2,471,453. Alfred L. Rummelsburg (to Hercules Powder Co.).

Reacting a menthene with a phenol in the presence of boron trifluoride. No. 2,471,454. Alfred L. Rummelsburg (to Hercules Powder Co.).

Preparing a terpene-substituted phenol by reacting (a) a terpene mixture containing dipentene, terpinolene, and similar monocyclic terpenes and cymene and menthane and (b) a phenolic material selected from the group consisting of phenol and commercial cresols in the presence of boron trifluoride as a catalyst. No. 2,471,455. Alfred L. Rummelsburg (to Hercules Powder Co.).

Plasticizing agent consisting of dialkyl phenylphosphonate containing from 4 to 8 carbon atoms in the alkyl groups. No. 2,471,463. Arthur Dock Fon Toy (to Victor Chemical Works).

Preparing para nitrophenyl diethyl thionophosphate by reacting diethyl thiono chlorophosphate with anhydrous sodium para nitrophenolate in the presence of an aliphatic tertiary amine catalyst. No. 2,471,464. Arthur Dock Fon Toy and Thomas M. Beck (to Victor Chemical Works).

Forming phosphonic and thiophosphonic acid chlorides by reacting an addition product of PCl_3 and a mono-olefin. No. 2,471,472. Willard H. Woodstock (to Victor Chemical Works).

Producing nicotinamide by partially hydrolyzing 3-cyanopyridine by the action of an inorganic alkalizing agent in aqueous solution. No. 2,471,518. Bernard F. Duesel and Harris L. Friedman (to Pyridium Corp.).

Oxidizing dioxane with an oxygen-containing gas to ethylene diformate. No. 2,471,520. Harold W. Fleming (to Phillips Petroleum Co.).

Reacting an acetylene and hydrogen fluoride by contacting acetylene and hydrogen fluoride with a solid catalyst comprising a catalytic material of the group consisting of aluminum fluoride and aluminum oxide. No. 2,471,525. John C. Hillyer and Joseph F. Wilson (to Phillips Petroleum Co.).

Separating olefines from gas containing hydrogen and small amounts of olefines and acetylene by separating the olefines and acetylene by selectively absorbing the olefines and acetylene in an aqueous solution of silver nitrate, maintaining in the solution free nitric acid and ferric nitrate to keep a silver acetylide complex formed by the absorption of acetylene dissolved in the silver nitrate absorbent and to prevent the precipitation of silver. No. 2,471,550. Joseph A. Shaw (to Koppers Co., Inc.).

Adduct of a compound of the formula RCH = CH_2 where R is a saturated hydrocarbon radical and an acid chloride of a chloracetic acid which contains two to three alpha-chlorine atoms. No. 2,471,570. Morris S. Kharasch and Wilbert H. Urry (to U. S. Rubber Co.).

Preparing 2,4-dichlorophenoxyacetic acid which comprises introducing elemental chlorine into phenoxyacetic acid in the molten state and in the absence of a solvent. No. 2,471,575. Richard H. F. Manske (to U. S. Rubber Co.).

Bodying a glyceride drying oil by admixing 3,4 epoxy 1 butene with the oil and heating. No. 2,471,577. Eugene W. Moffett (to Pittsburgh Plate Glass Co.).

Mercury compound corresponding to the formula $R—Hg—S—R_1—A$ wherein R is a member selected from the group consisting of alkyl, cycloalkyl and aryl univalent hydrocarbon radicals, R_1 is a member selected from the group consisting of alkylene, aralkylene and arylene divalent hydrocarbon radicals, and A stands for a tertiary dialkylamino group, R_1 being directly linked to the nitrogen atom of the latter. No. 2,471,621. Max Hartmann and Werner Bosshard (to Ciba Pharmaceutical Products Inc.).

Mercury compounds of the formula $[R—Hg—S—R_1—(R_2)_3]+A—$ wherein R is a member selected from the group consisting of alkyl, cycloalkyl and aryl univalent hydrocarbon radicals, R_1 is a member selected from the group consisting of alkylene, aralkylene and arylene divalent hydrocarbon radicals, R_2 represents an alkyl univalent hydrocarbon radical, and A is an anion selected from the group consisting of alkyl sulfate ions and aryl sulfonate ions. No. 2,471,622. Max Hartmann and Werner Bosshard (to Ciba Pharmaceutical Products, Inc.).

Preparing copal-like resinous esters by depolymerizing a reversible gel resin of a rosin acid-polyhydric alcohol ester containing free hydroxyl groups, the polyhydric alcohol being selected from the group consisting of glycerine and the pentaerythritols, said rosin acid-polyhydric alcohol ester being modified by reaction with maleic acid being free from fat acid esters. No. 2,471,629. William Krumbhaar.

Reducing a carbonyl compound selected from the class which consists of aldehydes and ketones to the methylene analog by reacting said carbonyl compound with an aqueous solution containing hydrazing hydrate, an alkali metal hydroxide, and a high-boiling solvent, evaporating low-boiling components from the reaction solution. No. 2,471,697. Huang Minlon (to Merck & Co., Inc.).

Preparing fumaronitrile by reacting α-chloroacrylonitrile with a water soluble cyanide of the group consisting of alkali metal cyanides and alkaline earth metal cyanides. No. 2,471,767. David T. Mowry and William H. Yanko (to Monsanto Chemical Co.).

Hydrocarbonoxybis trifluoromethyl benzenes. No. 2,471,829. Earl T. McBee, Robert O. Bolt and Robert Tebee (to Purdue Research Foundation).

Reacting a (trifluoromethyl)-halobenzene, halogen and trifluoromethyl being the only substituents on the benzene ring, and an alkali metal hydrocarbonoxide selected from the class consisting of alkoxides, cycloalkoxides, monocyclic aralkoxides, and monocyclic aryloxides and separating a hydrocarbonoxy (trifluoromethyl) benzene. No. 2,471,830. Earl T. McBee, Robert O. Bolt and Robert Tebbe (to Purdue Research Foundation).

Simultaneous introduction of fluorine and bromine into an unsaturated halohydrocarbon by mixing an unsaturated halohydrocarbon with bromine trifluoride and separating a more highly saturated organic compound having an increased fluorine and bromine content. No. 2,471,831. Earl T. McBee, Vincent V. Lindgren and Waldo B. Ligett (to Purdue Research Foundation).

Partially oxidizing naphthalene to phthalic anhydride by heating silica gel impregnated with vanadium pentoxide and partially oxidizing naphthalene vapor in an oxidizing gas stream. No. 2,71,853. Leland K. Beach and Gerald C. Connolly (to Standard Oil Development Co.).

Production of a normal aliphatic derivative of an aromatic compound by reacting an alkenylatable aromatic compound with a normal 1,3-diolefin in the presence of a catalyst comprising a complex resulting from saturating orthophosphoric acid with boron trifluoride. No. 2,471,922. William N. Axe (to Phillips Petroleum Co.).

Preparing methacrylonitrile by heating an α-dialkylaminoisobutyraldoxime. No. 2,471,927. Newman M. Bortnick and Darrel J. Butterbaugh (to Rohm & Haas Co.).

Preparing methacrylonitrile which comprises decomposing the dimeric addition product of isobutylene and nitrosyl chloride by treating it with an amine, whereby methacrylonitrile is formed, and separating the methacrylonitrile. No. 2,471,928. Newman M. Bortnick and George W. Cannon (to Rohm & Haas Co.).

Preparing methacrylonitrile by reacting pyridine and the dimer formed by the addition of equimolecular proportions of nitrosyl chloride and isobutene, thereby forming beta-oximino-tert.-butyl pyridinium chloride, separating said pyridinium chloride, heating, thereby forming methacrylonitrile, and separating methacrylonitrile from the heated pyridinium chloride. No. 2,471,994. Charles B. Wooster (to Rohm & Haas Co.).

Producing isoalloxazines by reacting a compound selected from the group consisting of an N-mono-aliphatic substituted phenyl amine and the mineral acid salts thereof with a violuric acid. No. 2,472,007. Walter G. Farkas and Leo A. Flexser (to Hoffmann-La Roche Inc.).

Petroleum

Production of improved diesel engine fuels by the catalytic isomerization of high boiling paraffins. No. 2,468,746. Bernard S. Greensfelder and Robert J. Moore (to Shell Development Co.).

Method of separating C_3 and higher hydrocarbons from high pressure gas. No. 2,468,750. George Louis Gudenrath (to Hudson Engineering Corp.).

Regeneration of a contaminated hydrogen fluoride catalyst containing water and relatively heavy organic material. No. 2,468,756. John O. Iverson (to Universal Oil Products Co.).

Reacting paraffins having at least 3 carbon atoms per molecule with olefinic hydrocarbons by subjecting a mixture of paraffins and olefinic compounds to temperatures of 750°-1100° F. and pressures of 500 pounds per square inch in the presence of a compound selected from the group consisting of carbon tetrachloride, carbon tetrabromide, chloroform, and bromoform. No. 2,468,899. Carlisle M. Thacker (to Pure Oil Co.).

Preparation of odorless fractions of highly branched paraffins. No. 2,468,986. Harold R. Legatski and Chester C. Crawford (to Phillips Petroleum Co.).

Lubricating oil composition comprising a hydrocarbon oil and an oil-soluble polyvalent metal salt of naphthenoxy-stearic acid. No. 2,469,003. Albert G. Rocchini (to Gulf Research & Development Co.).

Catalyst for the catalytic cracking of hydrocarbon oils consisting of homogeneous synthetic silica-alumina composite. No. 2,469,314. Lloyd B. Ryland and Miroslav Tamele (to Shell Development Co.).

Producing a mixture of oxidation products of unsaturated and saturated nature by heating sulfuric acid heavy alkylate produced by the alkylation of isoparaffins with olefins in the presence of a peroxide. No. 2,469,322. Eldon Lester Armstrong and Warren Andrew Beman (to Socony-Vacuum Oil Co., Inc.).

Conversion of hydrocarbons. No. 2,469,325. Otis L. Branson (to Socony-Vacuum Oil Co., Inc.).

Method for conversion of hydrocarbons. No. 2,469,332. Louis P. Evans (to Socony-Vacuum Oil Co., Inc.).

Haloalkylation of aromatic hydrocarbons. No. 2,469,334. Howard D. Hartough and Paul K. Chung (to Socony-Vacuum Oil Co., Inc.).

Catalytic alkylation in the presence of a fluophosphoric acid with boron trifluoride. No. 2,469,335. George C. Johnson and Barton W. Rope (to Socony-Vacuum Oil Co., Inc.).

Homogeneous gaseous phase catalytic alkylation of isobutane with cyclopropane in the presence of a halogen derivative of a hydrocarbon. No. 2,469,344. William A. Stover (to Socony-Vacuum Oil Co., Inc.).

Dehydrogenating hydrocarbons by contacting with a catalyst composed of activated alumina impregnated with beryllium oxide. No. 2,469,420. Carlisle M. Thacker (to Pure Oil Co.).

Lubricant comprising a mineral lubricating oil normally subject to oxidation having incorporated therein a tri-substituted phenol. No. 2,469,469. Herman D. Kluge and Edwin C. Knowles (to Texas Co.).

Producing an improved lubricating oil by subjecting a first mixture including alpha and beta olefins and alpha tertiary olefins to a separation to obtain a second mixture of alpha mono-olefins and alpha tertiary olefins, subjecting the second mixture to polymerization conditions in the presence of a polymerization catalyst to form a polymer in the lubricating oil boiling range. No. 2,469,725. Raymond L. Heinrich (to Standard Oil Development Co.).

Removing sulfur from tri-isobutylene comprising fractionating crude tri-isobutylene containing sulfur into three fractions and percolating the middle cut through silica gel. No. 2,469,726. William G. Hockberger (to Standard Oil Development Co.).

Cracking petroleum oil to produce motor fuel having high anti-knock properties by contacting with a metal oxide catalyst in the form of an aerogel. No. 2,469,733. Kenneth K. Kearby (to Standard Oil Development Co.).

Composition consisting essentially of tetraethyl lead and a small but stabilizing amount of a polymerized alpha-beta unsaturated acid ester. No. 2,469,737. John G. McNab and Harry W. Rudel (to Standard Oil Development Co.).

Improved process of synthesizing valuable conversion products from CO and H_2 in the presence of iron catalysts prepared by incorporating into an iron oxide a promotional amount of an alkali metal promoter, fusing the promoted oxide, shock-chilling the molten mass and reducing the cooled material with a gas rich in hydrogen. No. 2,469,755. Alexis Voorhies, Jr. (to Standard Oil Development Co.).

Production of catalysts of the silica-alumina type. No. 2,470,142. Charles C. Chapman and H. V. Hendrix (to Phillips Petroleum Co.).

Isomerization and alkylation of normal paraffins with a mixed catalyst consisting of anhydrous liquid HF and BF_3. No. 2,470,144. Louis A. Clarke (to Texas Co.).

Producing a higher boiling hydrocarbon by reacting an olefinic hydrocarbon and a monohaloalkane in the presence of a metal phosphate catalyst. No. 2,470,190. Louis Schmerling (to Universal Oil Products Co.).

Method of converting higher boiling hydrocarbons to hydrocarbons of lower boiling point by vaporizing and passing the vapors in contact at a cracking temperature with a magnesium silicate catalyst produced by subjecting lime and silica to reaction with a soluble magnesium salt. No. 2,470,193. William M. Stratford (to Texas Co.).

Synthesizing motor fuels of high antiknock value. No. 2,470,216. Percival C. Keith (to Hydrocarbon Research, Inc.).

Production of gasoline from higher boiling hydrocarbon oils through catalytic cracking. No. 2,470,263. Norman E. Peery (to Shell Development Co.).

Preparation of an improved silica-magnesia catalyst which comprises mulling a water suspension of silica hydrogel and magnesia, aging and drying. No. 2,470,410. Karl J. Nelson (to Standard Oil Development Co.).

Preparing a catalyst comprising silica and magnesia, adapted for the conversion of hydrocarbon oils, which comprises preparing a hydrous oxide of silica selected from the class consisting of silica hydrogel and gelatinous precipitated silica, intermixing said hydrous oxide with magnesia and water to form a slurry, mulling to form an intimate homogeneous mixture of said silica and said magnesia, aging, drying and activating the resulting product. No. 2,470,411. Eugene S. Corner (to Standard Oil Development Co.).

Producing high octane number gasolines by catalytically cracking light gas oil. No. 2,470,445. Kenneth M. Purdy (to Standard Oil Development Co.).

Lubricating composition for use under aqueous conditions and characterized by forming upon admixture with water-in-oil emulsion having lubricating properties which comprises a mineral oil having dissolved therein a blown semi-drying fatty oil and a hexitol anhydride partially esterified with a fatty acid of at least 12 carbon atoms and a polyoxyalkylene derivative of a hexitol anhydride partially esterified with a fatty acid of at least 12 carbon atoms. No. 2,470,537. Stanley P. Waugh (to Tide Water Associated Oil Co.).

Cracking hydrocarbon oils. No. 2,470,680. Harold Beuther (to Gulf Research & Development Co.).

Catalytic dealkylation of alkylated compounds while in contact with hydrogen, a metallic catalyst of the eighth group of the periodic table. No. 2,470,712. Charles W. Montgomery and William A. Horne (to Gulf Research & Development Co.).

Treating the reaction product obtained in the hydrogenation of carbon monoxide. No. 2,470,782. Henry G. McGrath, Herbert J. Passino and Louis C. Rubin (to M. W. Kellogg Co.).

Preparing a catalyst adapted for use in a Fischer-Tropsch synthesis by preparing an admixture of gamma iron oxide and alkali metal ferrate, heating in an oxidizing atmosphere, and subsequently contacting the admixture with a reducing atmosphere. No. 2,470,784. Max A. Mosesman (to Standard Oil Development Co.).

Preparing a catalyst adapted for use in a Fischer-Tropsch synthesis by preparing an admixture of alpha iron oxide and alkali metal ferrate, heating in an oxidizing atmosphere and subsequently contacting the admixture with a reducing atmosphere. No. 2,470,785. Max A. Mosesman (to Standard Oil Development Co.).

Preparing a catalyst adapted for use in a Fischer-Tropsch synthesis by preparing an admixture of ferro-ferric oxide and alkali metal ferrate, heating in the presence of an oxidizing atmosphere, and contacting the admixture with a reducing atmosphere. No. 2,470,786. Max A. Mosesman (to Standard Oil Development Co.).

Breaking petroleum emulsions of the water-in-oil type, by subjecting the emulsion to the action of a demulsifying agent comprising a product consisting of an oxyalkylated, drastically oxidized, partially hydroxylated member of the class consisting of polyethylenic acids and their glycerides; said partial hydroxylation being by agency of hydrogen peroxide; said oxyalkylation being by agency of an alkylene oxide having not over 4 carbon atoms, and said drastic oxidation being by agency of a gaseous oxygen containing medium. No. 2,470,808. Melvin De Groote and Bernhard Keiser (to Petrolite Corp., Ltd.).

Breaking emulsions composed of oil dispersed in a non-oily continuous phase, by subjecting the emulsion to the action of a reagent comprising an acylated derivative of a basic aminoalcohol. No. 2,470,829. Louis T. Monson (to Petrolite Corp., Ltd.).

Treating cracked gasoline to remove metals which catalyze oxidative deterioration, by contacting the cracked gasoline with a reagent solution of an ortho-hydroxy aromatic aldehyde in an excess of an amino compound selected from the group consisting of alkylene polyamine and alkanol amines. No. 2,470,887. Joseph A. Chenicek (to Universal Oil Products Co.).

Effecting hydrocarbon reactions in gaseous phase at high temperatures which comprises commingling hydrocarbon gases with highly heated refractory powder while said powder is substantially above the reaction temperature, sufficient to heat said gas to reaction temperature and supply the heat of reaction. No. 2,471,104. Edwin J. Gohr (to Standard Oil Development Co.).

Continuous method for recovering hydrocarbon oil from bituminous solids which comprises subjecting said bituminous solids to the influence of heated gases in a drying zone. No. 2,471,107. Charles E. Hemminger (to Standard Oil Development Co.).

Treating a hydrocarbon distillate containing sulfur and acidic constituents which includes the steps of forming a bed of clay, alkali sulfide and an alkali hydroxide. No. 2,471,108. Boyd N. Hill (to Standard Oil Development Co.).

Preparing an oil soluble additive for mineral lubricating oils by reacting a mixture of paraffin wax-phenol and an unsubstituted aliphatic monohydroxy alcohol containing 1 to 18 carbon atoms, such mixture having 1 to 2 wax-phenol hydroxyl groups for each molecule of alcohol, with a sufficient amount of phosphorus pentasulfide to convert the phenol and alcohol present into dithiophosphoric acids, and further converting the product thus formed with an oxidizing agent selected from the group which consists of potassium triiodide, sulfur dichloride, and sulfur monochloride capable of converting the same into a polysulfide. No. 2,471,115. Louis A. Mikeska (to Standard Oil Development Co.).

Fluidized shale autothermic distillation. No. 2,471,119. Edward B. Peck and Douglass G. Tomkins (to Standard Oil Development Co.).

Synthesizing hydrocarbons by contacting a mixture of carbon monoxide and hydrogen with a catalyst consisting of a reduced form of iron oxide having incorporated therein an alkali metal fluoborate. No. 2,471,129. Hans G. Vesterdal (to Standard Oil Development Co.).

Forming an iron-containing catalyst for use in promoting the synthesis of hydrocarbons from carbon monoxide and hydrogen, by incorporating an alkali metal fluoborate into iron oxide. No. 2,471,130. Hans G. Vesterdal (to Standard Oil Development Co.).

Catalytically converting hydrocarbons in which a hydrocarbon is contacted with a finely divided suspension of a cracking catalyst contaminated with metals promoting the formation of carbon and fixed gases, which comprises separating products of the reaction from the catalyst, regenerating said catalyst by combustion in the presence of an oxygen-containing gas, recovering regenerated catalyst and introducing into the reactor zone said regenerated catalyst and an inhibiting amount of nickel sulfide. No. 2,471,131. Prentiss S. Viles (to Standard Oil Dev. Co.).

Treating petroleum oil with a copper soap of a water-insoluble organic acid for the fixation of sulfur compounds. No. 2,471,153. Charles O. Hoover (to Air Reduction Co., Inc.).

Alkylation of isoparaffins by reaction with olefins in the presence of hydrogen fluoride. No. 2,471,211. S. T. Haddon (to Socony-Vacuum Oil Co., Inc.).

Passing a mixture of gas oil and steam through an elongated catalyst zone in contact with a bauxite cracking catalyst impregnated with nickel oxide synthesis catalyst, passing a mixture of hydrogen with carbon monoxide into said catalyst zone at a plurality of points along the length to form hydrocarbons substantially entirely heavier than methane. No. 2,471,228. Eugene V. Mathy (to Phillips Petroleum Co.).

Recovering ethylene from a feed stock containing the same in admixture with hydrogen and methane by a fractionation operation. No. 2,471,602. Philip M. Arnold (to Phillips Petroleum Co.).

Isomerization of olefins in the presence of hydrogen fluoride impregnated alumina. No. 2,471,647. Alex G. Oblad and Joseph U. Messenger (to Socony-Vacuum Oil Co., Inc.).

In a hydrocarbon synthesis process wherein carbon monoxide and hydrogen react in a synthesis zone in the presence of an iron type catalyst to form hydrocarbon constituents containing more than one carbon atom and wherein said iron catalyst disintegrates due to carbon formation resulting in loss of catalyst fluidity, the improvement which comprises using with said fluidized catalyst an inert fluidizable solid siliceous diluent which has previously been treated with an acid. No. 2,471,913. Simpson D. Sumerford (to Standard Oil Development Co.).

Producing gasoline synthetically by causing a mixture of carbon monoxide and hydrogen to contact at a suitable powdered synthesis catalyst. No. 2,471,914. Sumner B. Sweetser (to Standard Oil Development Co.).

Photographic

Dry conductive facsimile recording paper and an electrically discolorable coating therefor consisting of lead formate, titanium dioxide, zinc dust, polyvinyl acetate solution and ethyl acetate. No. 2,471,607. Frank G. Calkin (to Finch Telecommunications, Inc.).

Polymers

Interpolymers of drying oils, monoalkenyl-aromatic hydrocarbons, and divinylbenzene. No. 2,468,747. Gerald A. Griess and Arthur S. Teot (to Dow Chemical Co.).

Drying oil-styrene interpolymers. No. 2,468,748. Gerald A. Griess and Arthur S. Teot (to Dow Chemical Co.).

Adducts of unsaturated acids with cyclic polymers of hexadienes. No. 2,468,769. Rupert C. Morris and John L. Van Winkle (to Shell Development Co.).

Rosin-styrene interpolymers. No. 2,468,770. Earl D. Morris and Gerald A. Greiss (to Dow Chemical Co.).

Modified styrene-linseed oil interpolymers. No. 2,468,798. Arthur E. Young and Harold M. Hoogsteen (to Dow Chemical Co.).

Producing a thermoplastic resin from an unsaturated hydrocarbon distillate such distillate being derived from hydrocarbon polymers resulting from the treatment of cracked gasoline with a polymerizing adsorbent. No. 2,468,822. William K. Griesinger (to Atlantic Refining Co.).

A composition of matter comprising a major proportion of a liquid polymeric organo siloxane having on the average more than 10 silicon atoms per molecule, in which all the organic radicals are methyl radicals, there being at least 2 methyl radicals attached to each silicon atom, and a minor proportion in amount of an organo siloxane having on the average less than 6 silicon atoms per molecule, each silicon atom thereof having 2 hydrocarbon radicals attached thereto, in which latter organosiloxane the hydrocarbon radicals are both methyl and phenyl radicals. No. 2,468,869. William Herbert Daudt (to Corning Glass Works).

In aqueous emulsion polymerization of vinyl acetate, the step of adding to an aqueous polymerizable emulsion, in which vinyl acetate comprises at least 95% of the polymerizable monomer, a substance consisting of an unsaturated acid having the formula $C_nH_{2n-1}COOH$ in which $n = 9$ to 17. No. 2,468,923. William R. Cornthwaite and Harold W. Bryant (to E. I. du Pont de Nemours & Co.).

Plastic composition comprising a polymer of a monomeric material comprising vinyl chloride and a 4,4'-bis-alkyl-carbonate (diphenyl alkane). No. 2,468,975. Fred J. Held, Jr., and Robert P. Blaine (to B. F. Goodrich Co.).

Terminating the polymerization of butadiene-1,3 hydrocarbons wherein butadiene-1,3 is polymerized in aqueous emulsion in the presence of a peroxygen compound by supplying to the emulsion, at a time when 20 to 80% of the monomeric material is polymerized an organic compound possessing the quinonoid structure and a water-soluble inorganic sulfide. No. 2,469,017. Sherman A. Sundet (to B. F. Goodrich Co.).

Plastic composition comprising polystyrene resin and a normally liquid chlorinated paraffin wax. No. 2,469,107. Ludwig H. Dimpfl and William E. Elwell (to California Research Corp.).

Thermosetting urea-formaldehyde composition. No. 2,469,157. David E. Cordier (to Libby-Owens-Ford Glass Co.).

Homopolymer of a di-allyl acetal of a saturated aliphatic aldehyde of 1 to 4 carbon atoms. No. 2,469,288. David E. Adelson and Harold F. Gray, Jr. (to Shell Development Co.).

Solid resinous copolymer of monomers consisting of vinyl pyridine in which the vinyl group is directly attached to a carbon atom of the pyridine ring and a ketone selected from the group consisting of methyl, ethyl, propyl, butyl and isobutyl vinyl ketones and methyl isopropenyl ketone. No. 2,469,295. Richard L. Meier and William E. Elwell (to California Research Corp.).

Polyvinyl butyral resins. No. 2,469,318. Donald R. Swan (to Pittsburgh Plate Glass Co.).

Sanding sealers embodying polyvinyl butyral resins. No. 2,469,319. Donald R. Swan (to Pittsburgh Plate Glass Co.).

Interpolymerization of thiophene and butadiene. No. 2,469,326. Philip D. Caesar and Alexander N. Sachanen (to Socony-Vacuum Oil Co., Inc.).

Heating formaldehyde with a glycol having the general formula OH.R.SS.R.OH when R is a divalent alkylene radical condensing the formaldehyde and said glycol and obtaining a polymeric condensation product. No. 2,469,404. Joseph C. Patrick (to Thiokol Corp.).

Solid water insoluble organic cation exchange material comprising a sulfonated copolymer of indene with cyclopentadiene. No. 2,469,472. Frederick C. Nachod and William Wood (to Permutit Co.).

Water insoluble granular resinous material obtained by bringing together an alpha-chloro-beta, gamma-epoxy hydrocarbon and at least one alkylene polyamine. No. 2,469,683. James R. Dudley and Lennart A. Lundberg (to American Cyanamid Co.).

Insoluble granular resinous material obtained by reacting an alkylene polyamine containing an unsubstituted primary amino group with an organic compound containing a plurality of ethylene oxide groups. No. 2,469,684. James R. Dudley (to American Cyanamid Co.).

Anion active resins prepared from alkylene polyamines and hydroxy-substituted aliphatic polyhalides. No. 2,469,693. Lennart A. Lundberg (to American Cyanamid Co.).

Preparing a water-soluble polyacrylamide comprising adding polyacrylyl chloride dissolved in acetone to liquid ammonia. No. 2,469,696. Louis M. Minsk and William O. Kenyon (to Eastman Kodak Co.).

Producing polymerization products which comprises polymerizing in the presence of a Friedel-Crafts catalyst a mixture of substantial amounts of both a polymerizable isoolefin selected from the group consisting of

isobutylene, isoamylene, and isohexylene and an unsaturated ketone selected from the group consisting of isopropenyl methyl ketone, alpha-methylene -n-amyl methyl ketone, alpha-methylene isobutyl methyl ketone, ethyl isopropenyl ketone, methyl vinyl ketone, vinyl phenyl ketone, mesityl oxide, phorone, isophorone, benzalacetone, furfurylidine acetone, n-propenyl methyl ketone. No. 2,469,788. John B. Rust (to Montclair Research Corp.).

Copolymers of butadiene and alkyl esters of alpha, beta dichloroacrylic acid. No. 2,469,833. Joy G. Lichty (to Wingfoot Corp.).

Organo-polysiloxanes. No. 2,469,888. Winton I. Patnode (to General Electric Co.).

Linear methylpolysiloxanes, 2,469,890. Winton I. Patnode (to General Electric Co.).

Producing uniformly colored extruded articles from vinyl aromatic resins. No. 2,470,001. Kenneth E. Stober (to Dow Chemical Co.).

Emulsion polymerization of butadienes. No. 2,470,065. Carl E. Barnes (to General Aniline & Film Corp.).

Caustic resistant etherified phenolformaldehyde resins. No. 2,470,130. Howard L. Bender and Alford G. Farnham (to Bakelite Corp.).

Adherent plastic waterproof composition which stretches at 0° F. but at the same time maintains adhesion, comprising asphalt, rubber, residual asphalt, and naphthenic oil. No. 2,470,141. Lawrence C. Caves.

Polymerization of ethylene, by contacting ethylene under polymerizing conditions with a catalyst consisting of silica gel, chromia and a metal selected from the group consisting of nickel and cobalt. No. 2,470,166. Stanford J. Hetzel and Robert M. Kennedy (to Sun Oil Co.).

Preparing a polymeric composition by forming a compatible mixture of 4-vinylcyclohexene dioxide and a cellulose ester and maintaining said mixture in the presence of a polymerization catalyst until said 4-vinylcyclohexene dioxide is substantially completely polymerized. No. 2,470,168. Walter John Hornibrook (to Canadian Industries Ltd.).

Polymerization of olefins containing three or more carbon atoms per molecule by contacting with a catalyst consisting of silica gel, chromia and a metal selected from the group consisting of nickel and cobalt. No. 2,470,171. Robert M. Kennedy and Stanford J. Hetzel (to Sun Oil Co.).

Thermosetting molding composition comprising phenol-formaldehyde resin, cottonseed hulls and a flow modifier of cooked oil-extracted cottonseed meal. No. 2,470,322. Fritz Rosenthal (to University of Tennessee).

Production of improved polymers of halogen-containing ethenoid compounds by polymerising in aqueous emulsion a mixture of halogen-containing ethenoid compound with an unsaturated gylcidyl ester containing an unsaturated aliphatic group. No. 2,470,324. Hanns Peter Staudinger, Donald Faulkner and Maurice Dudley Cooke (to Distillers Co. Ltd.).

Acid resistant molding composition comprising asphalt admixed with a cellulosic fiber impregnated with a copolymer of styrene and maleic anhydride. No. 2,470,329. R. A. Barkhuff, Jr. (to Monsanto Chem. Co.).

Melamine-formaldehyde casting resin. No. 2,470,363. Harold W. Mohrman (to Monsanto Chemical Co.).

Urea-formaldehyde type of molding compounds. No. 2,470,393. Eustace Glycofrides (to Owens-Illinois Glass Co.).

Reacting furfuryl alcohol with catalyst consisting of a metallic halide of an acid nature, other than ferrous chloride and stannous chloride and thereby producing a thermoplastic resin. No. 2,470,394. Eustace Glycofrides (to Owens-Illinois Glass Co.).

Producing emulsion polymerizates of conjugated diolefins having 4 to 6 carbon atoms per molecule by effecting the polymerization in aqueous emulsion in the presence of water-soluble soaps of selectively hydrogenated tallow acids as the emulsifying agent. No. 2,470,417. Byron M. Vanderbilt (to Standard Oil Development Co.), and John D. Hetchler to Archer-Daniels-Midland Co.).

Polymerization process consisting of mixing an isoolefin and a poly alkylated phenol and polymerizing the mixture by the application of Friedel-Crafts catalyst dissolved in a non-complex forming solvent. No. 2,470,447. Carll F. Van Gilder (to Standard Oil Development Co.).

Making a polysiloxane resin by forming a solution of methyltrichlorosilane in a polyether solvent selected from the group consisting of bis (beta-ethoxyethyl) ether, ethylene glycol diethyl ether and mixtures thereof, adding water for hydrolysis of said trichlorosilane, adding dimethyldichlorosilane to the partially hydrolyzed trichlorosilane and thereafter adding water to the resultant product to convert all of the chlorosilanes to polysiloxanes. No. 2,470,479. Charles S. Ferguson and Charles E. Welsh (to General Electric Co.).

Hydrolyzing a mixture of chlorosilanes containing a major portion of methylchlorosilanes, methyltrichlorosilane forming a major portion of the methylchlorosilane component, the said mixture having a monovalent hydrocarbon-to-silicon ratio greater than 1.0 and less than 1.5, by slowly adding said chlorosilane mixture of water, a high-boiling hydrocarbon solvent, and a solvent selected from the class consisting of dioxane, bis-(beta-ethoxyethyl) ether and ethylene glycol diethyl ether. No. 2,470,497. Harry F. Lamoreaux (to General Electric Co.).

Composition of matter consisting of zein plasticized with mixed products resulting from the heating of a higher unsaturated aliphatic nitrile with a chromic acid oxidizing solution to cause cleavage of the double bond of a substantial portion of the unsaturated nitrile. No. 2,470,515. Latimer D. Myers and J. D. Fitzpatrick (to Emery Industries, Inc.).

Formaldehyde condensation products of mercaptans. No. 2,470,555. Marion W. Harman (to Monsanto Chemical Co.).

Emulsion polymerizing butadienes in the presence of an emulsifying agent and of an emulsion stabilizer which is the condensation product of about 3 moles of naphthalene beta-sodium sulfonate and a sodium sulfonate of a mixture of ortho, meta and para terphenyl with formaldehyde, and subjecting the emulsion thus formed to heat polymerization. No. 2,470,629. Gerry P. Mack (to Advance Solvents & Chemical Corp.).

Interpolymer produced from polyhydric alcohol polybasic acid, and interpolymer of monovinylaromatic compound, olefinic acid, and drying oil or oil fatty acid. No. 2,470,752. Edward G. Bobalek (to Arco Co.).

Interpolymer of monovinylaromatic compound, monocarboxylic olefinic acid and drying oil or acid. No. 2,470,757. Edward G. Bobalek (to Arco Co.).

Producing a soluble and fusible rosin maleic glycerine ester soluble in coal tar solvents. No. 2,470,855. William Krumbhaar.

Production of apolyolefinic material containing hydrocarbons possessing both conjugated and non-conjugated unsaturation which comprises contacting a hydrocarbon charge consisting essentially of saturated hydrocarbons with hydrogen fluoride. No. 2,470,894. Warren W. Johnstone (to Universal Oil Products Co.).

Preparation of granular polymers of vinyl halides while dispersed in an aqueous medium having dissolved therein as a dispersing agent a heteropolymer of vinyl acetate and a substance from the group consisting of maleic acid and maleic anhydride, and incorporating prior to polymerization an alkyl phthalate. No. 2,470,908. Massimo Baer (to Monsanto Chemical Co.).

Preparation of granular polymers of a vinyl halide while dispersed in an aqueous medium having dissolved therein as a dispersing agent a heteropolymer of vinyl acetate and a substance from the group consisting of maleic acid and maleic anhydride by incorporating in the aqueous medium a glycol ester of a fatty acid as a particle size reducing agent. No. 2,470,909. Massimo Baer (to Monsanto Chemical Co.).

Preparation of granular polymers of vinyl halides while dispersed in an aqueous medium having dissolved therein as a dispersing agent a heteropolymer of vinyl acetate and a substance from the group consisting of maleic acid and maleic anhydride by incorporating in the aqueous medium prior to polymerization a phosphoric acid ester of an hydroxy benzene from the group consisting of phenol, cresols, and xylenols. No. 2,470,910. Massimo Baer (to Monsanto Chemical Co.).

Preparation of granular polymerization products of vinyl halides by polymerizing an aqueous dispersion of a polymerizable material in the presence of, as a dispersing agent, a heteropolymer of vinyl methyl ether and a compound selected from the group consisting of maleic acid and maleic anhydride dissolved in the aqueous phase. No. 2,470,911. Massimo Baer (to Monsanto Chemical Co.).

Rosin acid ester of a polyhydroxy condensation product resulting from the condensation of formaldehyde and a ketone. No. 2,470,964. Harold Wittcoff (to General Mills, Inc.).

Manufacture of highly polymeric linear esters which comprises heating a compound from the group consisting of (1) acids of the general formula, $HOR\text{-}C_6H_4\text{-}COOH$, wherein R is a divalent radical from the group consisting of $(CH_2)x$ and $(CH_2)_xO$ wherein x is an integer not exceeding two and z is an integer greater than 1 but not exceeding 3, (2) ester forming derivatives of said acids, and (3) low molecular weight polymers obtained by heating said acids. No. 2,471,023. James Gordon Cook, James Tennant Dickson, Arthur Reginald Lowe, and John Rex Whinfield (to Imperial Chemical Industries Ltd.).

Improving petroleum microcrystalline residues which comprises treating them with aluminum chloride in the presence of hydrogen chloride and then blowing with air in the presence of a chlorinated hydrocarbon. No. 2,471,102. John J. Fish (to Sun Chemical Corp.).

Urea resins containing aminoalkoxy substituents. No. 2,471,188. Robert W. Auten (to Rohm & Haas Co.).

Residue carboxylic acid-alkylene diamine resins. No. 2,471,230. Charles H. McKeever (to Rohm & Haas Co.).

Methylpentadiene-aralkenyl copolymers. No. 2,471,234. Rupert C. Morris, Alva V. Snider and Eugene T. Bishop (to Shell Development Co.).

Aldehyde-polycyanoacetamido-compound condensation products. No. 2,471,243. John B. Rust (½ to Montclair Research Corp. and ½ to Ellis-Foster Co.).

Vinyl polymers plasticized with air blown extracts of mineral oil fractions. No. 2,471,266. Eric William Musther Fawcett, Eric Sylvester Narracott and Kathleen Joan Rowland (to Anglo-Iranian Oil Co. Ltd.).

Vinyl polymers plasticized with sulfur treated extracts of mineral oil fractions. No. 2,471,267. Eric William Musther Fawcett, Eric Sylvester Narracott and Albert Millien (to Anglo-Iranian Oil Co. Ltd.).

Aqueous emulsions of mixed phthalic glyceride and melamine-formaldehyde resins. No. 2,471,396. Donald W. Light (to American Cyanamid Co.).

Process of making a furfuryl alcohol resin. No. 2,471,438. Purnal L. McWhorter, Jr. (to Haveg Corp.).

Furfuryl alcohol resinous products. No. 2,471,600. William H. Adams, Jr. and Hans H. Lebach (to Haveg Corp.).

Furfuryl alcohol-phenol aldehyde resinous products. No. 2,471,631. Hans H. Lebach (to Haveg Corp.).

Preparing a latex containing dispersed, finely-divided particles of polyacrylonitrile by polymerizing acrylonitrile in an aqueous emulsion containing ethylene dichloride. No. 2,471,742. Stuart A. Harrison (to B. F. Goodrich Co.).

Preparing a latex containing dispersed, finely-divided particles of a resinous polymer of a nitrile of an alpha-methylene aliphatic monocarboxylic acid, by polymerizing a monomeric material in aqueous emulsion comprising an emulsified liquid non-polymerizable aromatic hydrocarbon. No. 2,471,743. Stuart A. Harrison (to B. F. Goodrich Co.).

Copolymer of styrene and a phenyl-vinyl acetate. No. 2,471,766. David T. Mowry and Charles L. Mills, Jr. (to Monsanto Chemical Co.).

Interpolymer comprising a biphenyl compound selected from the class consisting of vinylbiphenyl, vinylchlorobiphenyl and vinylfluorobiphenyl copolymerized with a compound selected from the class consisting of styrene, alphamethylstyrene and alpha, para-dimethylstyrene, said vinylbiphenyl compound. No. 2,471,785. Raymond B. Seymour and John Mann Butler (to Monsanto Chemical Co.).

Synthetic resin consisting of an alkali-insoluble copolymer of an alpha-beta-unsaturated dicarboxylic acid, a vinylidene compound containing a single olefinic group in the molecule, and divinylbenzene. No. 2,471-818. Melvin J. Hunter and William C. Bauman (to Dow Chemical Co.).

Lubricant which consists of a water-free liquid aliphatic-substituted polysiloxane, and an additive selected from the class of saturated aliphatic fatty acids containing from 8 to 14 carbon atoms. No. 2,471,850. Donald F. Wilcock (to General Electric Co.).

Reclaiming synthetic olefin-polyolefin-rubbery polymers comprising heating the sulfur cured polymer in the presence of a tertiary alphatic mercaptan. No. 2,471,866. Lawrence T. Eby (to Standard Oil Dev. Co.).

Composition of matter comprising a copolymer of isobutylene with a multiolefin having from 4 to 6 carbon atoms per molecule together with a polyalkylated monophenol having a methyl substituent in the para position and tertiary butyl substituents in both ortho positions. No. 2,471,887. Joseph F. Nelson (to Standard Oil Development Co.).

Polymerization of isobutylene in the presence of a solution of an aluminum halide in an alkyl halide. No. 2,471,890. Frederick A. Palmer (to Standard Oil Development Co.).

Production of a polymer from a polymerizable organic monomeric material, comprising a conjugated diolefin, which comprises forming an aqueous emulsion of monomeric material, admixing with said aqueous emulsion a polymerization activator consisting of ferrous sulfate. No. 2,471,938. W. W. Crouch and J. E. Pritchard (to Phillips Petroleum Co.).

In a process for polymerizing ethylenically unsaturated monomers, the improvement wherein the monomer is polymerized in the presence of a catalytic amount of an organic azo compound containing an acyclic azo, -N=N-, group having bonded to each nitrogen a discrete carbon atom of the class consisting of aliphatic and cycloaliphatic carbon atoms, at least one of said discrete carbon atoms being tertiary and one of the carbon atoms bonded to said tertiary carbon atom having its remaining valences satisfied only by elements of the class consisting of oxygen and nitrogen. No. 2,471,959. Madison Hunt (to E. I. du Pont de Nemours & Co.).

Processes & Methods

Continuously separating organic compounds capable of being selectively adsorbed by contact in the liquid phase with a solid adsorbent. No. 2,470,339. W. H. Claussen and W. H. Shiffler (to California Res. Corp.).

Fluid catalyst process for the conversion of hydrocarbons. No. 2,471,085. Marion James Wilcox and Ralph Elden Hall (to Sinclair Refining Co.).

Rubber

Preserving rubber by treating a sulfur vulcanizable rubber with a small

amount of the condensation product of a dihydroxy substituted benzene and a dihydric alcohol. No. 2,469,101. Edward S. Blake (to Monsanto Chemical Co.).

Reclaiming scrap containing vulcanized rubber which comprises heating in the presence of a small amount of a bis(alkoxy aryl) disulfide in which the alkoxy groups contain from 1 to 4 carbon atoms. No. 2,469,529. Lyndon B. Tewksbury, Jr. and Louis H. Howland (to U. S. Rubber Co.).

Composition of matter containing a synthetic, solid, plastic hydrocarbon interpolymer of a major proportion of isobutylene with a minor proportion of a conjugated diolefin together with dibenzyl azelate. No. 2,469,748. Winthrope C. Smith (to Standard Oil Development Co.).

Vulcanization of rubber compositions. No. 2,469,819. Paul J. Flory and Norman Rabjohn (to Wingfoot Corp.).

Coagulating a synthetic latex of a rubbery, conjugated diolefine emulsion polymerizate which comprises adding a water soluble salt of a metal of the group consisting of lead, iron, calcium, magnesium, strontium, barium, aluminum and zinc in the presence of a compound of the group consisting of ammonium hydroxide and the alkali metal hydroxides. No. 2,469,827. Joseph P. Johnson (to Wingfoot Corp.).

Rubbery copolymers of (trifluoromethyl) vinyl aromatic compounds. No. 2,469,845. Mary W. Renoll (to Monsanto Chemical Co.).

Preparation of methyl silicone elastomers. No. 2,469,883. James Marsden and George F. Roedel (to General Electric Co.).

Vulcanizing a sulfur vulcanizable rubber comprising a conjugated butadiene hydrocarbon polymer by heating the rubber in the presence of a di(hydroxy aryl) sulfide. No. 2,470,545. Edward S. Blake (to Monsanto Chemical Co.).

Di(orthoacylaminoaryl) disulfide softeners for rubbers. No. 2,470,945. Philip T. Paul (to U. S. Rubber Co.).

2,2'-dithio bis (n-aryl carbamic ester) softeners for rubbers. No. 2,470,946. Philip T. Paul and Lyndon B. Tewksbury, Jr. (to U. S. Rubber Co.).

2,2'-dithio bis propionanilide softener for rubbers. No. 2,470,947. Philip T. Paul (to U. S. Rubber Co.).

Di(orthoacylaminoaryl) disulfide softeners for rubbers. No. 2,470,948. Philip T. Paul (to U. S. Rubber Co.).

Di(orthoacylaminoaryl) disulfide softeners for isoolefin-diolefin copolymers. No. 2,470,949. Philip T. Paul (to U. S. Rubber Co.).

Production of chlorinated synthetic rubbers by reacting chlorine with a dispersion of rubber with carbon tetrachloride which contains a metallic napthenate. No. 2,470,952. Theron P. Remy.

Reclaiming mixed, previously vulcanized rubber scrap containing both natural rubber and an elastomer which is a rubbery copolymer of butadiene and styrene, comprising heating with abietic acid and Gray Tower resin oil which is a residual by-product obtained in the refining of gasoline. No. 2,471,496. Robert L. Randall (to Midwest Rubber Reclaiming Co.).

Rubber plasticizer composition comprising rubber and as a plasticizer therefore a diester of styrene glycol. No. 2,471,789. Frank J. Soday (to United Gas Improvement Co.).

Oil-resistant composition consisting of a rubbery butadiene acrylonitrile copolymer, a resin selected from the group consisting of polyvinyl formal, polyvinyl acetal and polyvinyl butyral, zinc oxide, sulfur, tricresyl phosphate, a vulcanization accelerator, a filler and anti-oxidant. No. 2,471,870. Philip T. Gidley (to Standard Oil Development Co.).

Specialties

Bleaching dark colored oil and fat stocks by treating with an acidic phosphoric compound selected from the group consisting of orthophosphoric acid, pyrophosphoric acid and acidic salts thereof, and oxygen in the presence of a silicate radical containing inhibitor. No. 2,468,753. Lloyd F. Henderson and Louis H. Libby (to Lever Brothers Co.).

Typographic printing ink characterized by its ability to be set by the application of water and its stability at high humidities, which comprises pigment dispersed in a vehicle containing as binder a resinous glycerol ester of endo methylene tetrahydro-phthalic acid dissolved in a liquid water-soluble solvent of the group consisting of polyglycols and their monoethers. No. 2,468,779. Charles A. Rietz and Raymond F. Lecture (to Interchemical Corp.).

Preparing an aluminum soap grease by preparing a solution of aluminum alkoxide in a hydrocarbon lubricating oil solvent, adding a higher fatty acid to said solution to convert said aluminum alkoxide to an aluminum soap and release alcohol. No. 2,469,041. Norman Lindsay Jones (to Standard Vacuum Oil Co.).

Hydraulic pressure transmitting fluid consisting of tricresyl phosphate, dipropylene glycol, ethyl ether of triethylene glycol, diamylamine phosphate, and dilisopropylamine nitrite. No. 2,469,285. Chester M. White (to Genesee Research Corp.).

Insect repellent comprising a mono (trimethyl benzyl) ether of ethylene glycol, and a liquid carrier therefor. No. 2,469,303. Robert B. Killingsworth (to Socony-Vacuum Oil Co., Inc.).

Preventing ice formation on surfaces by wetting with a homogeneous fluid consisting of 3-sulfolanol and water, water soluble alcohols, and mixtures thereof. No. 2,469,309. Rupert C. Morris and Edward C. Shokal (to Shell Development Co.).

Wood-preservative solution containing a soluble nickel salt, alkali metal ion, arsenic acid ion and a dichromate. No. 2,469,427. Roy H. Baechler.

Inhibiting foaming in steam boilers with a N,N'-disubstituted diamide of an organic dibasic acid. No. 2,469,450. Paul G. Bird and Arthur L. Jacoby (to National Aluminate Corp.).

Pattern material consisting of a mixture of hydrogenated castor oil and chlorinated naphthalene. No. 2,469,611. Kenneth E. Rose (to United Aircraft Corp.)).

Rendering hydrophilic substance water repellent by applying a liquid comprising an organo-silicon compound. No. 2,469,625. Arthur J. Barry (to Dow Chemical Co.).

Effecting drop-wise condensation of vapors by contacting said vapors with a cooling surface coated with a thin film of a compound produced by wetting said surface with an alcohol and treating the wetted surface with an organo-silicon halide. No. 2,469,729. James B. Hunter (to Atlantic Refining Co.).

Producing a sulfurized cutting oil base which comprises treating a crude dark colored aliphatic ester of hyrogenated rosin acids with a phosphorus chloride. No. 2,469,741. Arnold J. Morway and John C. Zimmer (to Standard Oil Development Co.).

Chewing gum base comprising a prolamine base, dibasic calcium phosphate, lecithin, and glycerine-water solution. No. 2,469,861. Wallace P. Cohoe (to American Chicle Co.).

Flame-proofing a combustible cellulosic material by impregnating with a polyethylenecimine and then treating the impregnated product with an aqueous solution of the reaction product resulting from the interaction of dipentaerythritol, orthophosphoric acid, and phosphurus pentoxide. No. 2,470,042. Andrew McLean and Stanley Frederic Marrian (to Imperial Chemical Industries Ltd.).

Well washing fluid comprising water, a water soluble salt of a carboxyalkyl cellulose ether and a metallic halide selected from the group consisting of alkili metal halides and alkaline earth metal halides. No. 2,470,132. William E. Bergman (to Phillips Petroleum Co.).

Petroleum oil, normally corrosive to copper by reason of its content of sulfur, containing an amount of tertiary-butyl hydroperoxide to inhibit such corrosion. No. 2,470,276. Franklin M. Watkins (to Sinclair Refining Co.).

Water emulsifiable cutting oil consisting of mineral base oil, oleic acid ester of partially dehydrated sorbitol, the reaction product of palmitic acid ester of partially dehydrated sorbitol with ethylene oxide and tricresyl phospate. No. 2,470,405. Hollis L. Leland (to Standard Oil Development Co.).

Reducing the corrosive action of a mixture consisting of water, air and carbon dioxide in contact with ferrous metal in steam boiler systems which comprises injecting carbon disulfide. No. 2,470,428. Elza Q. Camp (to Standard Oil Development Co.).

Insulation composition consisting of dry powdered boric acid mixed with dry disintegrated newsprint. No. 2,470,641. Frederick G. Portz.

Composition from which the solvent may be completely removed, adapted to use as a glue or varnish consisting of a clear, ungelled solution of polyvinyl chloride and benzaldehyde. No. 2,470,761. Jean Delorme and Rene Bluma (to Societe Anonyme des Manufactures des Glaces et Produits Chimiques de Saint-Gooain).

Reducing the adhesion of ice to the surface of a rubbery material normally subjected to icing conditions which comprises associating with the surface of said rubbery material a liquid polymeric silicone. No. 2,470,772. Eugene G. Haas (to B. F. Goodrich Co.).

Composition of matter consisting of triethyl phosphate and di-iso-butyl ketone. No. 2,470,792. Walter Schlesinger and Paul Becher.

Soft solder flux comprising a mixture of a glutamic acid compound and an organic amino compound. No. 2,470,957. James E. Strader (to Battelle Memorial Institute).

Sealing compositions containing chlorinated diphenyl and graphite. No. 2,471,010. Laurence L. Rector and Charles L. Cross.

Permeable organic material being mildew-proofed by a heavy metal salt of a halogenated polyphenol sulfide containing from 3 to 10 phenol radicals. No. 2,471,261. Elmer W. Cook and Philip H. Moss (to American Cyanamid Co.).

Solvent composition for flushing engine lubrication systems consisting of ortho dichloro benzine, cresylic acid, naphtha, sulphurized tributyl phosphite, and magnesium soap of wax acids. No. 2,471,390. John D. Morgan and Russell E. Lowe (to Cities Service Oil Co.).

Non-corrosive soldering flux consisting of rosin, stearic acid, and petroleum jelly. No. 2,471,451. William H. Rinkenbach and Arthur J. Clear.

Bonding together surfaces of material composed substantially of cellulose by applying a composition containing polyvinyl alcohol, formaldehyde and hexamethylene tetramine. No. 2,471,497. Robert Pierce Roberts and Kenneth Jones (to Celanese Corp. of America).

Liquid rust preventive composition adapted to form a water-impervious film on metal surfaces consisting of a mineral oil, petrolatum wax, an oil-soluble wetting agent, and blown soya oil. No. 2,471,638. Paul R. McCarthy (to Gulf Research & Development Co.).

Dry rosin size composition consisting of rosin size stabilized against oxidation by phenothiazine. No. 2,471,714. Justus C. Barthel, Arnold R. Davis and Edward Nichols Poor (to American Cyanamid Co.).

Flux coating composition consisting of graphite, alkaline earth metal carbonates, silicon metal powder, heavy metal oxides selected from the group consisting of manganese dioxide and both manganese dioxide and lead oxide, and deoxidizing ferro alloys, admixed with a concentrated aqueous solution of an alkali-metal silicate, containing a wetting agent and an anti-foaming agent. No. 2,471,803. Rene D. Wasserman.

Refining solid ouricury wax by contacting ouricury wax with a paraffin hydrocarbon having at least 6 carbon atoms, separating the insoluble portion, and recovering ouricury wax from the soluble portion. No. 2,471,805. Edward A. Wilder (to S. C. Johnson & Son, Inc.).

Leak stopping composition for water-containing vessels including finely divided fibrous material mixed with waste liquor from tanning operations in which quebracho, chestnut, mangrove, myrobalans and divi-divi have been used. No. 2,471,856. Craig A. Blair (to "X" Laboratories, Inc.).

Rust preventive composition consisting of a major proportion of volatile hydrocarbon, a plasticizer, and an ester of a polyhydric alcohol selected from the group which consists of pentaerythritol and polypentaerythritol, said ester containing one esterifying radical of a saturated fatty acid having from 12 to 22 carbon atoms and three radicals of saturated carboxylic acid having 1 to 4 carbon atoms. No. 2,471,889. Miriam A. Paliwoda and Gordon W. Duncan (to Standard Oil Development Co.).

In coating ferriferous metal to increase its corrosion resistance the method which includes the step of treating the surface with a bath the essential coating-producing ingredients of which consist of an aqueous solution of phosphate from the class which consists of alkali metals and ammonium, also containing soluble chlorite. No. 2,471,907. Eugene Snyder (to American Chemical Paint Co.).

In coating ferriferous metal the method which includes the step of treating the surface with a composition the essential coating producing ingredients of which consist of an aqueous solution of phosphate from the class which consists of alkali metals and ammonium, said solution also containing a soluble peroxygen compound. No. 2,471,908. Eugene Snyder (to American Chemical Paint Co.).

Textiles

Finishing textile fabrics by treating with an aqeous solution of alkylene polyamine and a salt of copolymerized styrene maleic anhydride selected from the group consisting of ammonium salts and amine salts and then drying the fabric, whereby said treating agents react to form an insoluble resin on the fabric. No. 2,469,407. Donald H. Powers and Elmer H. Rossin (to Monsanto Chemical Co.).

Finishing textile fabrics by treating with an aqueous solution of an ammonium salt of copolymerized styrene-maleic anhydride and a water-soluble alkyl ether of methylol melamine, whereby said treating agents react to form an insoluble resin thereon. No. 2,469,408. Donald H. Powers and Elmer H. Rossin (to Monsanto Chemical Co.).

Finishing textile fabrics by treating with an aqueous solution of a substance selected from the group consisting of formaldehyde and water-soluble polymers of formaldehyde and a salt of a copolymer prepared by copolymerizing a substance selected from the group consisting of styrene and substituted styrenes with a substance selected from the group consisting of maleic anhydride and partial esters of maleic anhydride, said salt being selected from the group consisting of ammonium salts and amine salts and then drying whereby said treating agents react to form an insoluble resin on the fabric. No. 2,469,409. Donald H. Powers and Elmer H. Rossin (to Monsanto Chemical Co.).

Producing filamentary reaction products of rubbery polymers with sulfur dioxide. No. 2,469,847. Gottfried Ernst Rumscheidt, Willem Leendert and Johannes de Nie (to Shell Development Co.).

Composition capable of depositing a heat sensitive non-tacky flexible film on textile fibers, which comprises a fusible oil-modified alkyd resin emul-

sion, and an emulsion obtained by adding a peroxide to an emulsion of a soluble tacky butadiene polymer and heating. No. 2,470,953. John W. Robertson and John B. Rust (½ to Montclair Research Corp. and ½ to Ellis-Foster Co.).

Bath for treating wool to give shrinkproofing which comprises an aqueous substantially stable emulsion containing a synthetic chloroprene polymer. No. 2,471,456. John B. Rust (to Montclair Research Corp.).

Water, Sewage, Etc.

Softening of water by subjecting the water containing water-hardening compounds to contact with a cation-exchange material produced by heating a residual acid sludge from the refining of mineral oil fractions, and treating the resultant heated sludge mass with an alkali metal compound, and separating the water from said cation-exchange material. No. 2,471,213. Eric Berkeley Higgins (to Tewin Industries, Inc.).

Trade marks of the Month

A Checklist of Chemical and Chemical Specialties Trademarks

VITA-CLOR. Waterproofing compound for wood, brick,, concrete and like building materials. 474,561. Vita-Var Corp.

SWIRT. Liquid kerosene base emulsion for degreasing metal articles. 486,628. Phillips Chemical Co.

Nordcoseal. Valve lubricating greases, lubricating oils and solid lubricating compounds. 487,139. Rockwell Mfg. Co.

MELLO SHEEN. General Cleansing agent. 495,984. Paulsen & Roles Labs.

DOHRCO. Floor wax. 500,744. Dohrmann Hotel Supply Co.

FOAMKLEEN. Emulsifying and cleansing agent. 501,881. Stedford Chemical Co.

MASKIT. Soap compounds. 508,477. Harco Chemical Co.

MICO. Synthetic baking and air drying enamels. 509,434. Midland Industrial Finishes Co.

(Symbol). Chemical preparations to be used with well drilling fluids. 510,490. Diamond Alkali Co.

DIAMUD. Chemical preparations to be used with well drilling fluids to enhance the drilling characteristics. 510,491. Diamond Alkali Co.

FOGLESS ALBRIGHT. Cleaning preparation for glass. 510,802. Cleo Clark.

BLUSHbrite. Preparation to be used as a disinfectant, germicide, and deodorant. 510,804. Thomson-Smeltzley Corp.

Florentino M. Cabigas. Insecticides. 511,090. Florentino M. Cabigas.

Tintex. Dye. 511,724. Park & Tilford.

OILTONE. Flat wall paint. 511,727. Seidlitz Paint & Varnish Co.

Kling-Tite Paint Products. Paint in liquid and paste form. 511,729. Kling-Tite Paint Products Co.

MAE-SON-ETE. Combined cleaning and polishing preparations for use on floors. 513,693. Mae-Son-Ete Co.

BI-VAR-CO. Oil paints in paste or liquid form. 515,606. Bissell Varnish Co.

ADVANCE. Synthetic liquid hydrocarbon polymers, mixtures of polybutene polymers and hydrocarbon waxes, wetting and foaming agents, polyglycol esters suitable for use as emulsifiers, wetting agents, softeners and penetrating agents, cresylic acids, dibenzyl ethers, alkylated aryl sulphonates, carboxylic acids, sodium hydrocarbon sulphonates, plasticizers, vinyl stabilizers, aluminum soap of naphthenic acids, rubber tackifiers. 517,684. Advance Solvents & Chemical Corp.

O'BRIEN'S. Ready mixed paint. 517,794. O'Brien Varnish Co.

Terra-Tone. Penetrating liquid. 520,033. Higley Chemical Co.

STALPIC. Resinous plastic solution used as protective coating. 520,652. Stalpic Coating Corp.

Si-O-Lite. Silica gel having a general use in the industrial arts. 523,402. Mallinckrodt Chemical Wks.

SOLUX. Ready-mixed liquid paints. 523,549. Soled Paint Co.

M & H. Liquid solvent for preserving and restoring used paint and varnish brushes. 526,613. M & H Labs.

MARBLEHEAD. Ready-mixed anti-fouling compositions or paints for marine use. 528,150. Stearns-McKay Mfg. Co.

FYREX. Ammonium phosphate as a flameproofing compound. 528,535. Victor Chemical Wks.

(Symbol). Fertilizer. 529,851. Armour & Co.

KLIX. Non-inflammable dry cleaning fluid. 530,183. Fleischer Mills, Inc.

H C. Baking and paint enamels. 530,188. Gilmore & Nolan, Inc.

HYPO. Moth preventative and insecticide. 530,395. Galree Products Co., Inc.

GUMOLITE. Solubilized insoluble natural gum for the thickening of color pastes. 530,773. Royce Chemical Co.

INLAND. Cleaners and solvents for cleaning surface of rubber articles. 531,603. Inland Rubber Corp.

WEARPROOF. Paint. 531,826. Patek Bros., Inc.

ARVISOL. Detergent for cleaning glasses and beer systems. 531,863. Taylor Precision Manufacturing Co.

BOWES SEAL FAST. Tire wall paint. 532,204. Bowes "Seal Fast" Corp.

L-BO GREASE. Household cleaner. 533,595. Moore & Son.

SPRAY BRITE. Liquid glass cleaner. 535,539. Spray Brite Co.

KURFEES. Prepared or ready-mixed liquid paint enamels. 535,544. J. F. Kurfees Paint Co.

KURFEES. Prepared or ready-mixed liquid paints. 535,561. J. F. Kurfees Paint Co.

KURFEES. Prepared or ready-mixed liquid paint primers. 535,567. J. F. Kurfees Paint Co.

Q. Synthetic organic detergents, soaps, solvent cleansers for cleaning textiles; for detergents for general washing purposes; for oils and chemicals used for conditioning, waterproofing, and softening leather; soaps made from sulphonated oils and/or organic synthetic detergents having general cleansing properties, except for sodium silicate as such. 535,872. Quaker Chemical Prods. Corp.

"Linoleum Louie"—"I'll Floor You". Floor wax. 537,448. Gertz and Cook, Inc.

Amercoat. Marine finishes. 537,648. American Pipe & Construction Co.

HAWTHORNE. Ready mixed paint. 538,069. Armstrong Paint & Varnish Wks.

KEY-TONE. Ready-mixed paints. 538,291. Keystone Varnish Co.

(Symbol). Paints. 538,787. W. W. Lawrence & Co.

CLEARSTRIP. Adhesives. 539,340. National Starch Products, Inc.

BLACK EAGLE. Stove polish. 539,619. Nickel Plate Stove Polish Co.

FLOTILLA. Soaps. 540,145. Armour & Co.

SEIDLITZ "Best by Test". Paint in paste or semi-paste form, varnish, and lacquer. 540,323. Seidlitz Paint & Varnish Co.

MARBLEHEAD. Lime used for industrial and construction purposes. 540,429. Marblehead Lime Co.

PLASTI-GLAZE. Glazing compound. 540,453. Plastic Products Co.

ARMELLO. Ready-mixed paints. 540,616. Armstrong Paint & Varnish Wks.

ARMLAC. Lacquer. 540,622. Armstrong Paint & Varnish Wks.

Klimate-Pruf. Paints. 540,679. Klimate-Pruf Paint Co., Inc.

SAN-PLAS. Plastic wall finish. 540,695. Morris Paint & Varnish Co.

(Symbol). Heat and flame protected metal paint. 540,857. North American Fibre Prods. Co.

JIFFY-CUT. Paint and varnish remover. 540,877. Republic Paint & Varnish Co.

PLASTIFLAT. Ready-mixed paints. 541,382. Armstrong Paint & Varnish Wks.

SHLAX. Quick drying finish for bare wood surfaces. 541,449. Republic Paint & Varnish Co.

VANI-TONE. Water-mixed, washable, quick drying emulsified resin paints. 541,451. Republic Paint & Varnish Co.

TUNG-ALTUM. Utility paint and asphalt base aluminum paint. 541,453. Republic Paint & Varnish Co.

SUR-FILL. Floor surface coating. 541,460. Republic Paint & Varnish Co.

CLEAN TIM. Soluble cleaner, cleanser, and detergent. 542,535. Clean Tim, Ltd.

Model-Wed. All-purpose adhesive cement. 542,539. Crag Products, Inc.

R-ROYCE CHEMICAL CO. General cleaning and scouring compound. 543,995. Royce Chemical Co.

Deb. Air refresant preparation. 544,063. Deb Co.

VANE-CALVERT'S. Ready-mixed oil paints. 544,132. Vane-Calvert Paint Co.

FORITE. Liquid lacquers and enamels. 544,274. Pittsburgh Plate Glass Co.

WEBITE. Liquid paint enamels. 544,281. Pittsburgh Plate Glass Co.

ENCOLOID. Lecithin and lecithin containing compounds. 544,437. Enco Chemical Corp.

SUN CHEMICAL CORPORATION. Caulking compounds. 545,789. Sun Chemical Corp.

Chase-O. Soluble cleaner, cleanser and detergent. 546,425. Procter & Gamble Co.

SORBIT. Wetting agent, penetrating and foaming agent for use in processing textiles. 546,937. Alrose Chemical Co.

DETREX. Drycleaning solvents, metal cleaning solvents. 546,965. Detrex Corp.

Pall Mall. Sudsing cleaner, cleanser and detergent. 547,346 Hewitt Soap Co., Inc.

Sole-Garde. Water resisting and leather mellowing compound. 547,564. Manufacturing Labs., Inc.

ARCOLENE. Paste dry cleaning soap. 548,451. Armour & Co.

OLEX. Soap. 548,462. Armour & Co.

ESCOTE. Paint used for coating paper and cloth. 549,021. Edward Smith & Co., Inc.

I X L. Interior varnish. 549, 022. Edward Smith & Co., Inc.

LOXOIL. Varnish extender. 549,023. Edward Smith & Co., Inc.

STAR AND CRESCENT. Soldering flux. 549,562. McGill Mfg. Co., Inc.

UNOX. Surface-active chemical compositions. 549,615. Carbide and Carbon Chemicals Corp.

ROYAL FLUSH. Chemical preparation for removing rust and dirt and cleaning the cooling systems of automobile radiators. 550,049. Lion Chemical Co.

HYDRONATE. Water soluble sulfonated petroleum surface active agents. 551,143. L. Sonneborn Sons, Inc.

SWAX. Cleansing and waxing preparation. 551,162. Carsolite Corp.

LACLEDE. Lubricating oils and greases. 551,325. Sinclair Refg. Co.

SPRIN-CLAR. Calcium chloride compound. 551,882. Faesy & Besthoff, Inc.

CLENA-FORM. Liquid cleaning agent. 552,040. College Pharmacy Prods.

ACTO. Petroleum sulfonates. 552,510. Stanco Inc.

PERMA-DRI. Ready-mixed, liquid, and oil paints and paint coatings. 552,613. Stephenson Air Brush Paint Co.

Vimlast. Ready-mixed paints and paint thinner. 553,044. C. A. Woolsey Paint & Color Co., Inc.

Bismate. Rubber accelerators. 554,929. R. T. Vanderbilt Co., Inc.

"TABFORM". Rubber accelerators. 554,930. R. T. Vanderbilt Co., Inc.

STRODEX. Chemical liquid or solid for use as a detergent, wetting agent, or dye assistant. 555,656. Dexter Chemical Corp.

LAVAX. Paint enamels, varnishes, and ready mixed paints. 556,024. Pittsburgh Plate Glass Co.

Sidox. Pigment material. 556,102. Interchemical Corp.

INTER-PLAST. Ready-mixed paints, enamels, varnishes and solvents therefor, and paste paints. 557,041. International Paint Co., Inc.

INTER-TEK. Ready-mixed paints, enamels, varnishes, and solvents therefor, and paste paints. 557,043. International Paint Co., Inc.

FICON. Concentrated lathering synthetic detergent in liquid form. 557,839. Fischer Industries, Inc.

SNOWFINE. Sodium sesquicarbonate. 558,978. Allied Chemical & Dye Corp.

Deod-o-matic. Deodorant blocks of the chemical type. 559,178. Puro Co., Inc.

CALTEC. Precipitated calcium carbonate. 559,400. West Virginia Pulp and Paper Co.

VERMI-TOX. Insecticide in liquid form. 560,386. De Pree Co.

NACCONOL. Detergent preparations. 560, 953. Allied Chemical & Dye Corp.

INJEX. Anti-detonation fluid for internal combustion engines. 561,152. Standard Oil Co.

Mrs. Foamy. Cleaning liquids for spots. 565,005. Parker Products.

COLORSUDS. Soap, used for laundry purposes. 565,561. H. Kohnstamm & Co., Inc.

BLUE SUDS. 565,607. Blue Suds Co.

SPIRCO. Cleanser for wood, cork and linoleum. 565,638. Walter G. Legge Co., Inc.

TRAFCO. Cleanser for wood, cork and linoleum. 565,640. Walter G. Legge Co., Inc.

GREEN LIGHT. Insecticides. 565,553. Klauss-White.

NURATEX. Permanent type anti-freeze with propylene glycol base. 565,658. NuWay Prods. Co.

CERT-O-CIDE. Grain fumigant. 565,911. Cook Chemical Co.

INVINSO. Dishwashing compound. 566,036. John Sexton & Co.

47. Detergent washing powder. 566,098. Pfanstiehl Detergent Chemicals, Inc.

WET ANSCOUR. Fatty acid condensate for wetting out and scouring textile fabrics. 566,930. Haas-Miller Corp.

NCG. Chemical fluxes. 566,999. National Cylinder Gas Co.

ARGO. Chemicals derived from corn—namely, polysaccharide, zein, calcium phytate, and inositol. 567,185. Corn Products Refining Co.

Octofen. Fungicide. 567,707. McKesson & Robbins, Inc.

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